UC Berkeley
Interactive University Project

NTIA Award Number: 06-60-96071

Final Evaluation Report

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(December 17, 1998)

The UC Berkeley
Interactive University Project

K-12 PROJECT EVALUATION REPORT

Period Covering October 1, 1996 to September 30, 1998

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December 17, 1998

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I. BACKGROUND

This Evaluation Report discusses the successes and lessons learned from the two-year UC Berkeley Interactive University (IU) Project, a demonstration technology project funded by the U.S. Department of Commerce Telecommunications Information Infrastructure Assistance Program (TIIAP). The Report contains the following: Section I gives background information on the Interactive University Project; Section II discusses the theoretical framework and specific issues investigated through evaluation; Section III describes the evaluation methods used; Section IV provides the results of the evaluation; and Section V presents a discussion of our results and a set of recommendations. The complete text of the evaluation plan, a matrix of evaluation issues vs. target audience, and sample evaluation instruments can be found in several appendices.

A. Statement of Need

In California, particularly in urban settings such as the San Francisco Bay region, there is a need for increasing the performance of K-12 students particularly in the areas of literacy, mathematics, science, and technology. A large proportion of students from Bay Area urban school districts consistently score below the national average in standardized tests (http://star.cde.ca.gov) and perform at low levels of academic achievement. These challenges make it difficult for these students to pursue a college education. As a land-grant university, the University of California has an obligation to participate in educational outreach, working together with K-12 schools, community groups, local government, and corporate partners to better prepare K-12 students to be eligible to attend college in general and the University in particular, for careers, and for lifelong learning.

At UC Berkeley, close to a hundred educational outreach programs exist in all disciplinary areas, working with schools at all grade levels. Until recently, these programs have traditionally worked independently of each other and without consistent levels of coordination with school district priorities. The Berkeley Pledge and the Interactive University Project have responded to the need for a coordinated, sustained educational outreach framework in partnership with four urban school districts in the Bay Area (West Contra Costa, Berkeley, Oakland, and San Francisco).

The Berkeley Pledge is a coordinating unit for outreach within the Chancellor's Office committed to sustaining campus diversity and excellence by providing equal opportunity and access to all, particularly those students most disadvantaged and underrepresented in higher education in California. In 1995, the University of California Regents eliminated race, ethnicity and gender from consideration in student admissions. The Regents' subsequent call on UC campuses to "take relevant actions to develop and support programs" that increase "the eligibility rate of groups which are underrepresented in the university's pool of applicants," led to the creation of the Berkeley Pledge. The Pledge targets K-12 and undergraduate students through coordinated outreach, recruitment, and support programs. The Pledge has brought together campus groups from various departments and units to work with a cluster of K-12 schools in each district in the areas of literacy, mathematics, student recruitment and retention, and technology as a tool for accessing multi-disciplinary content and for collaboration.

The Interactive University (IU) Project is the technology arm of the Berkeley Pledge. IU began in 1995 as a campus-wide initiative to coordinate technology-based outreach to K-12 schools. The IU set out to explore how we can best use the Internet for K-12 educational outreach, particularly for disadvantaged urban communities. Executive Vice Chancellor and Provost Carol T. Christ is the principal investigator and sponsor of the project. Approximately forty campus academic and outreach departments participate in the IU.

B. The Interactive University K-12 Project Description:

In October 1996, Berkeley, in partnership with the OUSD and the San Francisco Unified School District, received a $650,000 two-year grant from the Department of Commerce's Telecommunications Information Infrastructure Assistance Program (TIIAP) to build a national model of the use of the Internet for University/K-12 collaboration. This grant resulted from the campus' and school districts' commitment to collaboratively experiment with the Internet for educational outreach. Total project funding amounted to approximately 5 million dollars over two years, with a large percentage of non-federal matching funds. Funding was provided by the U.S. Department of Commerce TIIAP, the Chancellor's Office, the Berkeley Pledge, UC Berkeley's Information Systems and Technology, the forty campus departments and units involved in the pilot projects, the San Francisco and Oakland School Districts, AT&T, IBM, Pacific Bell and Sun Microsystems.

1. Goal and Objectives

The **goal** of the IU K-12 Project is to develop a national model of how the University can best use the Internet to help K-12 students, their families, and teachers in disadvantaged urban communities. Project **objectives** are to:

- enhance student achievement;
- foster collaboration between the campus and schools;
- promote the integration of teaching, research, and community service; and
- identify effective, scaleable, and sustainable Internet outreach methods.

These objectives correspond with school district goals to: (1) improve teaching and learning; (2) improve staff, parent and community participation in the educational process; and (3) increase integration of technology into the curriculum.

2. Pilot Projects

The heart of the IU is a set of twenty pilot projects conducted over the past two years, involving campus faculty, students, and staff and Oakland and San Francisco teachers and students. These projects explored various Internet mediated outreach methods including: digital curriculum development; access to digital library and museum collections; on-line access to faculty and distinguished visitors; electronic mentoring; electronic tutoring; electronic recruitment and admissions counseling; and the facilitation by University personnel of peer-to-peer networks of teachers and students in the schools. Projects used, and integrated with the curriculum, a wide variety of Internet tools: e.g., e-mail, the Web, MOOs, and desktop video-conferencing. Teachers from schools in San Francisco and Oakland were the key K-12 partners in these pilot activities. The IU Project funded departments and units from all major disciplines on the UC Berkeley campus to carry out pilot programs in the areas of K-12 core and supplementary curriculum, mentoring, recruitment, and the transition from school to career. Pilot projects took place at 10 high schools, 10 middle schools, and 6 elementary schools in Oakland and San Francisco.

3. Collaborative Framework

The Interactive University established a framework for inter-campus collaboration as well as campus/school-district collaboration. At the University, decision-making is generally distributed into the hands of individual departments and units. In the context of educational outreach, a de-centralized mode of operation has generally resulted in individual, uncoordinated projects that rarely share experiences and are prone to redundancy. Both the Berkeley Pledge and the

Interactive University efforts have established a needed campus structure to facilitate communication and collaboration. Without the Interactive University structure, it would have been difficult for the various campus groups to become aware of other similar projects and to establish collaborations. Interactive University Project activities provided a forum for continued communication and sharing among campus groups. A campus-wide collaboration infrastructure also results in a more systemic approach, addressing common issues such as program evaluation and K-12 technology infrastructure. Key elements of the inter-campus collaborative framework included:

- Facilitation of collaborations among campus groups through quarterly meetings and showcase events;
- Interactive University Freshmen Seminar to engage undergraduate students in the project;
- Seminar Series to highlight the various pilot efforts and share the project's progress with the campus community; and
- Interactive University Project Faculty Advisory Committee.

The IU also established a robust human and programmatic infrastructure that built strong relationships among campus and K-12 groups. Differing expectations regarding the nature of the pilot projects and the lack of a common language required several planning iterations to define pilot project content. Collaborative work went beyond the design and implementation of individual pilot projects to encompass considerable effort defining technology infrastructure and professional development strategies in the schools. Key elements of the district/university collaborative framework included:

- Interactive University Project Steering Committee: This committee was chaired by UC Berkeley's Executive Vice Chancellor and Provost Carol Christ, and composed of senior representatives from school districts, local government, and corporate partners. The charge of the Steering Committee was to recommend how the UC Berkeley Interactive University Project can best coordinate with other agencies and industry for maximum leverage and benefit to K-12 schools.

- District/University IU Project Liaisons: Two full time teachers on special assignment served as project liaisons, whose roles were critical to our model of collaboration, since they had access to key district information and procedures, and served as conduits of communication between IU campus personnel and district personnel at multiple levels.

- Joint Strategic Planning Group: A team composed of key IU campus and K-12 district players who met every six weeks to discuss long-range project strategy, and to reflect on challenges, lessons learned, and best practices.

- Monthly meetings between University IU managers and Associate Superintendents for Curriculum and Instruction, as well as District Technology Coordinators in both San Francisco and Oakland.

The above collaborative structure was a necessary pre-requisite to carry out project implementation and evaluation.

4. Leadership

Support from leadership at all levels (Executive Vice Chancellor/Associate Superintendents; Pilot Project Coordinator/School Principals; campus personnel/teachers and other school personnel) was

essential to: (a) leverage resources, (b) validate a culture of service and outreach, (c) ensure substantial commitment and in-kind support from partners, and (d) identify supportive policies and incentive/promotion strategies to encourage participation by campus personnel in educational outreach.

5. Implementation of Major Activities

- Twenty Pilot Projects: The heart of the IU is a set of twenty pilot projects conducted over the past two years, involving campus faculty, students, and staff and Oakland and San Francisco teachers and students. These projects explored various Internet mediated outreach methods including: digital curriculum development; access to digital library and museum collections; on-line access to faculty and distinguished visitors; electronic mentoring; electronic tutoring; electronic recruitment and admissions counseling; and the facilitation by University personnel of peer-to-peer networks of teachers and students in the schools. Projects used, and integrated with the curriculum, a wide variety of Internet tools: e.g., e-mail, the Web, MOOs, and desktop video-conferencing. Teachers, district curriculum specialists, and counselors from schools in San Francisco and Oakland were the key K-12 partners in these pilot activities. The IU Project funded departments and units from all major disciplines on campus to carry out pilot programs in the areas of K-12 core and supplementary curriculum, mentoring, recruitment, and the transition from school to career. Pilots projects took place at 10 high schools, 10 middle schools, and 6 elementary schools in Oakland and San Francisco. We supported individual campus units in the evaluation of their pilot efforts, and conducted project-wide evaluation tapping the expertise of the UC Berkeley Graduate School of Education.

- Comprehensive IU Web site: An extensive Web site was created at the location: <http://iu.berkeley.edu/iu> that includes: links to all the pilot projects and their deliverables (teacher and student web pages, digital curriculum, best practices for their subject matter, etc.); on-line evaluation instruments for pre/post questionnaires; an archive of pilot project highlights <http://iu.berkeley.edu:7017/Pages/news/article_archive>; etc. For an example student project "Virtual African Mask Gallery" please see: <http://www.sfusd.k12.ca.us/schwww/sch641/virtual/mask_3fr.htm>.

- UC Nexus Project: The UC Nexus Project is a statewide initiative of the University of California to promote high quality education in California's schools through computers and Internet technology. The program is designed to join together UC's existing efforts in instructional technology and make them more accessible to, and supportive of, K-12 teachers, students, and their schools and communities. The Interactive University Project was selected by the UC Office of the President to design and implement a model collaboration to enable structured and very large scale involvement of UC students, faculty, and staff in K-12 schools throughout California--with a particular emphasis on the learning practices of students, families, and teachers in disadvantaged public schools. Interactive University and UC Nexus are creating a gateway Web site that will
provide a collaborative space for K-12 outreach while serving the entire 9-campus UC System and the K-12 community throughout California.

- Pilot Project Planning Process with School Districts: Our Strategic Planning Team, working with other key school personnel (Associate Superintendents for Instruction and Curriculum, District Technology Coordinators, Project Liaison, Teachers on Special Assignment from both Oakland and San Francisco), designed a staged planning process to align schools' and campus partners' goals for the pilot projects. The process facilitated (1) identification of school and campus pilot project partners; (2) planning between campus and school participants; (3) project sign-off by principals and district personnel; and (4) allocation of TIIAP school-district

subcontract grant funds in support of pilot projects. Key steps of this planning process included district-wide open houses for the Interactive University project, a school application and buy-in process, and a planning retreat for pilot project participants.

- Project-Wide Events: We held a two-day kickoff presentation on the UCB campus, several technology demonstration and training events during the two years of the project involving pilot project participants, and closure events at each of the partnering districts that showcased the accomplishments of the pilot projects. These events served to: (1) bring all campus and school district pilot projects together; (2) share information about the progress of the pilot projects; (3) provide training and overall orientation to Internet tools for collaboration.

- On-going Professional Development for K-12 and Campus Participants: Project-wide Internet technology training (e-mail, videoconferencing, Web browsing, Web authoring, chat tools, etc.) took place early in the project. The training was offered at the UCB campus in connection with the kickoff event, and at the OUSD's Technology Learning Center. The training sessions at OUSD were open to pilot project participants in both Districts. As part of their matching effort in support of the IU project, the San Francisco and Oakland Districts have established on-going technology training workshops for IU teacher participants.

II. Review of the Literature

A. Internet Technology for K-12 Education

The use of Internet technology provides a unique opportunity for fostering engaging and active student learning in the schools. Decades of research on technology use in schools suggest that, properly used, technology can enhance the achievement of students (United States Department of Education, 1996). The specific uses of Internet technology includes on-line access, the use of multi-media images, video and audio technologies, and distance learning via live interactive communications.

The effects of such Internet technology use are not in the technology itself, but in the instruction which is enabled by technology (Copley, 1997). Instruction is enabled by myriad factors that accompany the well-planned use of technology in schools. Although these factors are interrelated, they can be classified into three broad categories. First, technology use allows for interactive learning through a constructivist, student-centered process. Students with access to technology have been found to learn how to organize complex information, recognize patterns, draw inferences and communicate findings (United State Department of Education, 1996; Cradler, 1994). Second, equity and increased achievement is enhanced within a technology-rich classroom (Cradler, 1995). Increased achievement has been found for a wide range of students, including at-risk, learning disabled, and Limited English Proficient (LEP) students. This occurs through increasing basic skills, motivation and equity. Lastly, technology use affects classroom dynamics and teaching methods by changes in interactions within the context of the classroom (United States Department of Education, 1996; National Coalition for Technology Education and Training, 1997; Copley, 1997; Cradler, 1995). In combination, these factors can form a powerful classroom tool, which allows teachers to better engage a wider range of students.

1. Technology and Constructivist Learning

Technology has significant potential to reform education and enhance student achievement by refocusing attention on the learner and the learner's own knowledge construction. The individual's construction of knowledge has been a predominant theory in the learning sciences, i.e. cognitive science. In particular, work by Piaget has been the source of large volumes of work on the constructivist process, and its implications for learning and education. Brodzinsky, Sigel, &

Golinkoff (1981) describe Piagetian theory as the construction of knowledge through the organization, structuring, and restructuring of experience. Piaget asserted that existing schemes of thought become modified through interaction with the physical and social world in a unique way by different individuals based upon their own pre-existing schemas and prior knowledge. Computers and Internet technology allow for constructivist learning by enabling students to conduct self-paced learning, active seeking and confirmation of knowledge sources, and optimally, interaction with knowledge sources not easily accessible through more traditional means.

Many of the goals of constructivist learning have been achieved in classrooms which have effectively utilized technology in education. Research has revealed that technology increases performance when interactivity is prominent, and that instructional programs provide for interactive opportunities (Cradler, 1994). Students using Internet technology can solve situational problems. Students can apply higher order thinking skills to the analysis and synthesis of real-life problems. The outcomes in teaching also reflect the constructivist paradigm. Findings reveal that technology allows for less directive and more student-centered teaching, and an increased emphasis on individualized instruction.

Cradler (1994) in a review of the research related to technology and educational achievement, highlighted particular features critical for effective technology applications. These features can greatly facilitate constructivist learning. He describes that there needs to be immediate adjustment of task difficulty in relation to student responses, and instant feedback of correctness of responses. This allows students to spend significantly less time gathering data, and focus on understanding what data mean. Furthermore, the degree to which the learner has control over learning (i.e. self-pacing), has been found to be a benefit of technology (see review by Copley, 1997). If these features of educational technology use are upheld, then the learner is provided with the opportunity to engage in an environment that optimally facilitates active learning, self-directed learning, and problem-solving.

2. Access and Student Achievement

Internet technology expands student access in the context of the core curriculum by enabling students to tap wider networks of knowledge from organizations, universities, and other remote expertise. The Center for Applied Special Technologies conducted a national study of on-line communications in schools (see review by Copley, 1997). Their findings reveal that fourth and sixth grade students scored significantly higher on two to four learning measures. They concluded that on-line access helps students become independent and critical thinkers. Furthermore, the students are able to effectively express their knowledge and ideas in compelling ways.

Technology use has been credited for increasing achievement by affecting motivation, attitudes, and confidence. Technology-rich schools report higher attendance and lower drop-out rates (Copley, 1997). Studies on technology use reveal that students are more challenged, engaged, and independent when using technology. Students gain a greater sense of responsibility for their work. For example, it has been noted that student writing that is shared with other students over a network tends to be of higher quality than in-class writing samples. By engaging in self-directed and more independent learning, students seem to acquire a greater sense of ownership for their work and their own learning. Furthermore, studies reveal that students are empowered by he ability to teach others about technology use. In fact, students often know more about computer operation than do their teachers (see review by US Department of Education, 1996).

Lastly, Internet technology allows for student achievement gains for a wide range of students. Gains have been documented for learning disabled, low-income, and LEP students. Examples of Internet technology reveal the methods by which this can be achieved. Teachers can connect their students with students from other classrooms. For example, using a listserv teachers can connect with other classrooms studying a similar topic of interest. One teacher described that the connection

of inner city urban students with private school students allowed for the exchange of scientific information that would not spontaneously happen within a classroom (Cradler, 1995). Teachers can bring in students with different or special needs to work together on the same project. Technology use has been shown to significantly improve problem-solving skills of learning disabled students, and writing skills and attitudes for urban LEP students. The individualized nature of instruction offered by technology use allows students to engage at their own pace, responding to their needs.

3. Classroom Dynamics and Teaching Methods

The use of technology in education also provides a unique avenue to alter classroom dynamics. The classroom context is changed through different types of interactions among students and teachers, increased family involvement, and teachers' development and awareness of new teaching methods. Technology used to promote student-centered learning can help teachers and students interact in fundamentally different ways. Teachers are less directive, and spend more time advising students (Cradler, 1994). Project-based activities not only allow students the independence to engage in self-directed learning, but teachers can spend less time providing information and more time engaging with students about the information collected. Technology also increases student collaboration on projects. This allows the teacher more time to individualize instruction. Student group projects also allow students to exercise their communication, and interpersonal skills.

4. Impact on Students and Families

The involvement of families in their child's education is a critical avenue to increased student achievement. An increase in family involvement has been found to occur through increased time on educational activities at home, increased communication between teachers and parents about their children's assignments, and even students teaching their parents about technology (US Department of Education, 1996). Some projects have included the provision of computers at home. Yet, the avenue for increased family involvement can stem from within the classroom as well. For example, students in one school district created an electronic bulletin board to provide the community with information, and announcements. Technology can serve as a powerful avenue to increase parental involvement in their children's education.

5. Impact on Teachers

Recent research from Apple Classroom of Tomorrow (ACOT) reveals that technology prompts teachers to question old assumptions about instruction and learning. Outcomes for educators include rethinking and revision of curriculum and instructional strategies, and greater participation in school and district restructuring efforts (Cradler, 1994). Teachers report increased interest in teaching, productivity, and increased planning and collaboration with colleagues (Cradler, 1994). Teacher collaboration though Internet technology allows teachers to overcome the isolation they experience in their classrooms (see review by US Department of Education, 1996). These aspects of technology use can alter classroom dynamics and teaching strategies by providing teachers with more awareness, resources, and knowledge in the classroom.

B. Collaborative Partnerships

Collaborative efforts between schools and universities are recognized for their potential positive impact on educational improvements for students. At one level, schools benefit because of university experience and training, while universities can benefit by not having to divert resources to remediation of students who were not adequately trained in elementary and secondary school (Lagowski, 1994). On another level, collaborations are likely to become more common and necessary for institutional growth because of diminishing funds and resources for education (Lasley, Matczynski, & Williams, 1992). Funding for education is not increasing and given

competing requests for funds or resources, both human and fiscal, collaborative partnerships enable educators to make the most of their efforts without compromising the quality of their program endeavors.

This emphasis on cooperation rather than competition in collaborative partnerships encourages educators to work together to design programs that meet the primary needs of all constituents. Furthermore, cooperative efforts diminish the likelihood of duplication of effort and wasted resources. Collaboration is most effective when there are agreed-upon goals and a common means of reaching those goals. It takes time to reach consensus on the methods to be used, and it takes effort and personal sacrifice to reach the compromises that are necessary in partnerships. However, the benefits gained through collaborative partnerships are reflected in educational improvements for children.

In a true school-university collaboration, each institution is an equal partner, working towards the solution of common problems while meeting their own self-interests (Fiorentino, Kowalski, & Barrette, 1993). This perceived common interest is what draws parties to collaborate. Collaborative partnerships require an investment of time, energy, and emotion by all constituents to subordinate special interests and to make egalitarian decisions and equitable participation possible. Given this goal of shared power and mutual vision, how is a successful collaboration built?

1. Building a Collaborative Partnership

Digby, Gartin, and Murdick (1993) identify factors to consider in developing effective university and public school partnerships. These authors stress the importance of early identification of possible partnership schools and demographics, such as student socioeconomic levels, student ages, minority composition, school size, and school location. Other important factors to consider are the needs and interests of public school teachers, and how they can match the specific research interests and pedagogical agendas of the university personnel. The partnership should focus early on areas of mutual interests and concern, and collaborators need to recognize the perspectives of all involved. The collaborators also need to delineate the nature, structure, and purpose of the partnership arrangement and establish goals and short-term objectives. True collaboration demands interdependence since no school-university partnership is successful unless both parties are eager to participate.

2. Elements of an Effective Collaboration

Aside from a shared goal and an eagerness to participate, there are other considerations in developing an effective collaboration. A review of the literature on numerous school-university collaborations revealed various content and goals, but themes emerged about necessary elements for a truly effective partnership (Digby, Gartin, & Murdick, 1993; Goodlad, 1994; Fiorentino, Kowalski, & Barrette, 1993; Lagowski, 1994; Noguera, 1997).

The first element is communication. The effective transmittal of information within a relationship is essential in a public school-university partnership. Without it, each partner may be unaware of the demands and needs of the other. Opportunities for dialogue also allow for the acknowledgment of problems and honest self-evaluation of the effectiveness of existing systems. Furthermore, when the research and educational outreach interests of the university coincide with the interests of the school, more productive relationships are possible and serve as the basis for collaboration.

Once communication is established, partners must show concern by recognizing and meeting the needs of both institutions through agreed upon goals. Participants must work to provide the resources that will contribute to the partnership. There should be acknowledgement and rewarding of participation, time, and effort so all partners feel validated.

Even when the communication of needs is effective, partners must realize that meeting identified needs requires time and planning. As a result, compromise becomes important, as well as focusing on active solutions.

The underlying premise of an effective partnership must be commitment by both sides to the relationship. They must be committed to the idea that forming a university-public school partnership will lead to improvement in the educational system by increasing the quality of education for all involved. Commitment also implies that time and resources will be allocated by each partner.

3. Benefits

Considering the time and effort invested in building a school-university collaboration, what benefits can be expected? Partnerships can provide an effective means by which universities and public schools may initiate curricular programs to meet the unique needs of their area; provide new ways of organizing and allocating responsibility among teachers, administrators, and university educators; new ways of allocating budgets and new sources of funding as well as more efficient uses of existing resources to support instruction; and encouragement, resources, and opportunities for collaboration between public school and university colleagues for thinking, developing, evaluating, and revising ideas about teaching and learning (Digby, Gartin, & Murdick, 1993).

On a professional level, teachers may find that by having outsiders in their classrooms and asking questions about what they are doing will compel them to think about their teaching in new ways (Zietlow, 1992). Furthermore, teachers will gain confidence in sharing their knowledge and practical expertise with university educators, and they will also benefit from university training and research.

4. Challenges and Issues

Such an effort to organize school and university personnel does not happen easily, and is not without challenges. As noted earlier, collaborations take more time and effort to reach consensus, as well as personal sacrifice of individual goals to reach compromise (Lasley, Matczynski, & Williams, 1992).

Furthermore, there are issues of "turf" and control (Payzant, 1992; Lieberman, 1992). Both the school and university have their work defined, and may guard what they view as theirs. A clash of cultures may also occur as school systems and universities may have different norms, roles, and expectations (Goodlad, 1994). For example, the regimen of time and space in the schools versus the relative freedom of time and space in the university; an ethic of inquiry in the university versus an ethic of action and meeting immediate needs in the schools. Both sides need to arrive at a full understanding of how the other agencies operate and a willingness to overcome the differences.

Another challenge is the importance of leadership at the top (e.g., University presidents and deans, school superintendents, executive directors) to support the mission, vision, and sense of what the organization can be about (Goodlad, 1994; Payzant, 1992). Similarly, it should be acknowledged that the process of partnerships is slow as lines of communication are being established, working relationships nurtured, and structures being built. Structures and processes do not happen instantly, and patience for results and continued support for the project are necessary (Goodlad, 1994).

In addition to support by leadership at the top, decisions about leadership within the collaboration are necessary. Leadership is best seen as empowerment and shared responsibility (Goodlad, 1994), not power to just one or several figures. The more leadership is spread around, Goodlad contends, the better off the partnership will be.

Finally, how people can be motivated to participate and maintain their involvement is important to consider. Based on inducements-contributions theory (Haymore-Sandholtz & Merseth, 1992), when people's contributions to an organization outweigh the perceived inducements, they may question both their commitment to and continued participation in the organization. Therefore, the balance between demands and rewards is an important factor to consider as educational institutions attempt to reform structures, operating procedures, and curriculum. Teachers put considerable amounts of time into their jobs outside of school working hours. Extrinsic inducements/rewards as well as intrinsic inducements/rewards need to be considered as teachers, as well as university members, make decisions about how to allocate their time and energy. Haymore-Sandholtz and Merseth (1992) found that extrinsic rewards in power, status, and pay helped to sustain teachers' participation. Power consisted of involvement in decision making, as teachers formerly had few opportunities to formulate policy and that their input now led to observable changes. Status related to their opportunities for grant writing or presentations at state and national conferences. Teachers realized that professional educators valued their input and considered them as equals. Finally, although the pay was an honorarium or stipend, given the amount of time required of the teachers, the pay fell far short of their hourly rate. However, they viewed the compensation as having more symbolic than real value, as their status as professionals was validated. Intrinsic rewards included gains in expertise, increased knowledge and efficacy in teaching techniques, enhanced collegial interaction, and more positive attitudes and feelings about themselves as teachers. What this implies is a balance between demands and benefits, but more importantly, that teachers and university personnel need to feel validated for their efforts.

5. Collaboration and Technology

Given the benefits of Internet technology for K-12 reform discussed earlier, it seems logical to combine the advantages of collaborative partnerships and of technology use to reap greater educational rewards. Jacullo-Nolo (1992) describes the Technology Institute which was designed as a school-university partnership between a liberal arts college and five urban public schools districts. The goal was to bring technology to teachers and increase student opportunities to learn. The Institute provided in-service teacher development opportunities, and it was hoped that knowledge about computing would enable teachers to develop their students' knowledge about computers and their skills in using them. It was found that the program influenced how participating teachers used computers in their classroom and made a marked impact on their professional lives. The results indicated that 90 percent of those responding to the survey said the training increased their confidence in their teaching. Ninety-one percent reported increased enthusiasm for teaching, 95 percent had an increased interest in curricular reform using computers in the classroom and 96 percent had an increased interest in continued professional growth. Students also benefited, as 90 percent of the teachers reported that their students' interest in subject content had increased, and over half reported that student attendance had increased and class disruption decreased. Furthermore, over 88 percent of the teachers reported increased student participation.

Related to professional growth, the National Education Association's Mastery in Learning Project, which helps school communities restructure based on university research on effective teaching, learning, and curriculum, allowed teachers nationwide to access the computer-network. Perry (1992) reported that the technology allowed teachers to talk frequently with other teachers across the country, helped them to draw on resources and ideas beyond their classroom, and provided on-going support without barriers of time and distance. Furthermore, technology was found to be an efficient way to meet students' diverse needs with different children doing different things at the same time.

III. Evaluation Methodology

The evaluation of the Interactive University Project was designed to:

1. Examine how Internet-based technology can be best utilized within K-12 schools and classrooms to improve teaching and learning, increasing integration of technology into the curriculum; and
2. Identify important components of 'collaboration-building' among university and K-12 partners within the context of technology implementation.

A. Tiered Evaluation Plan

Due to the scope of the project, a tiered evaluation plan was developed comprising two primary levels: *micro-level* pertaining to individual pilot projects, and *macro-level* pertaining to the IU as a whole. The micro-level evaluation focused on key issues of student achievement and the specific consequences of using technology-based methods of outreach. The macro-level evaluation addressed project-wide issues of collaboration involving University and community partners using the Internet, project sustainability, and project scale. Please refer to Appendix A for the complete text of the evaluation plan.

Strategies were developed to gather data using a combination of human interactions and technology-mediated interactions. The following data collection methods were used:

a. pre/post questionnaires
b. focus groups
c. interviews (audiotaped and videotaped)

Appropriate combinations of the above instruments were selected to assess the broad issues of:

- Impact of the Internet on:
  - Student achievement
  - Teacher practices
- Role of the Internet in Building and Sustaining a Collaboration
- Integrating research, teaching, and service
- Technology Issues
- Key issues related to design and implementation of the IU project (efficacy of procedures and methods used)
- Issues related to sustainability and scale

Target audiences included: K-12 students; K-12 teachers; K-12 administrators; adult school students; UCB students (graduate and undergraduate); UCB faculty; UCB staff; and project coordinators. Please refer to Appendix B – a matrix of evaluation issues versus target audience.

Evaluation baseline data were gathered from K-12 and campus pilot project participants (K-12 teachers, students, school and district administrators, as well as UCB staff, faculty, and students). In addition to interviews and questionnaires for individual participants, the evaluation team designed a focus group protocol to elicit in-depth detail on lessons learned and best practices. These focus group interviews involving campus and K-12 participants were conducted during Fall and Spring of the 1997-98 school year.

Macro-Level Evaluation: The IU evaluation team collected and analyzed common data from project participants along the following themes:

- Key Learning Experiences (e.g. what obstacles were encountered? how were they overcome?)
- Effective Strategies (e.g. what made an impact on student achievement and why? are strategies sustainable? do they scale? what were unintended consequences of using technology and information infrastructure?)
- Recommendations (e.g. what are important issues and steps to take in the context of collaboration? how do Internet tools enable and facilitate University faculty, staff, and student participation in systemic educational outreach efforts?)

Micro-Level Evaluations: Each pilot project collected and summarized pilot project activity data using assessment measures determined within the scope of their particular project emphasis, and project-specific evaluation instruments with guidance provided by the IU evaluation team, as appropriate.

B. Data Collection and Analysis Procedures

The pre/post questionnaires for all target audiences were placed on the Web, tied to a back-end database <http://iu.berkeley.edu/iu>. The IU evaluation employed the Descriptive Survey method as described by Leedy (1985). All interviews and discussions were videotaped or audiotaped, and transcribed. Transcriptions of the interviews were used for analysis and interpretation. Analysis of the qualitative data followed the principles of qualitative data analysis as outlined by Miles and Huberman (1984) comprising data reduction and display, conclusion drawing and verification. Within this framework, the data were analyzed for common thematic components. Quantitative analysis of the survey data was conducted to provide aggregate summative information about specific target groups.

III. Results

This section will address the following issues:

1. Impact of Internet technology on student achievement and teacher practices;
2. The role of Internet technology in building and sustaining a collaboration;
3. The role of Internet technology in integrating teaching, research, and service;
4. Key issues related to technology implementation and use for education;
5. Key issues related to the administration of the IU Project; and
6. Issues related to IU Project's potential to scale and be sustained.

A. How do Internet technology collaborations promote student achievement?

1. Knowledge of college and universities

With one exception, individual Interactive University projects did not specifically target students' knowledge about colleges and universities. Yet, as part of students' interactions with university personnel and resources (coordinators, faculty, etc.), students became exposed to the university in various ways. These included: campus visits, chats with faculty or other individuals, face-to-face or technology-based interactions with university personnel. The evaluation questionnaires and interviews aimed to identify if students had gained knowledge about the university in these various aspects: college requirements, college research, college life, possible majors and subject areas of interest.

Students' gathering of information about universities and colleges was found to increase from 66% to 76%. The universities and colleges for which they had gathered information included mostly the University of California, California State Universities, Community Colleges and finally various other public and private universities in and out of California. There was also a 4 percentage point

increase in students correctly reporting one or more college admission requirements. Students' correct responses ranged from listing courses, to listing GPA and SAT requirements.

Teachers overwhelmingly (75%) felt that students had gained knowledge about the university through their participation in the project. Teachers referred to students' knowledge about resources available at the university (i.e., libraries). Teachers also felt that their interactions with University personnel and facilities "demystified the University and made it more attainable."

> "Students began to have discussions about their educational plans after graduating from their [high school] class; college has emerged as an option. Some students used the Internet to research college courses, looked at campus maps, majors." [K-12 teacher]

2. Attitudes about university and college

Information about student attitudes as well as teachers' perceptions of student attitudes about university/college were also collected. Before the onset of project activities, 84% of the students planned to attend some university or college. After completion of the projects, 79% of students surveyed responded that they were planning to attend college. Students were also asked if the project had affected their attitudes about attending college. Fifty nine percent of students did not feel that project had affected their attitude about attending college, while 21 % of students felt the project had affected their attitudes.

While few students felt that the project had affected their attitudes about college, 88% of teachers felt the project had affected students' attitudes. Teachers most often described that students' attitudes had been affected in the following ways: through raising students' awareness of college, and raising students' interest in attending college.

> "Yes, I feel their views have been affected. I believe working this closely with people at the University level has made them realize that they can make it to college, too. I also feel that some of the material made them realize just how challenging college could be." [K-12 teacher]

Differences before and after the project were found on students' reported views of the perceived benefits of attending college. By the end of the project, there was a 4% increase in student views of a positive relationship between college attendance and future success, a 5% increase in the view that college attendance is desirable, and a 4% increase in the perception that college is more difficult than high school.

There were also differences found in student perceptions of the benefits of attending college. By the end of the project, there was a 15% increase in students listing education and learning as a benefit of college attendance. Also, students increasingly revealed that money and future career prospects are benefits from college attendance (increase of 7% and 4%, respectively). The most common drawbacks listed by students in both pre and post surveys included cost and time.

3. Knowledge about subject matter

Projects were asked to locally assess student knowledge in the subject matter being addressed. Increased knowledge in specific topical areas was reported by 15% of the teachers. Teachers most often described broad factors addressing the question about the IU project's effect on student academic progress. Teachers most commonly listed the following areas of academic achievement as being affected: 1) critical thinking/ problem-solving skills; 2) computer use; and 3) increased interest in subject matter. These factors represented indirect measures of knowledge pertaining to the broader goals of curriculum and teaching, rather than specific content knowledge. For example,

the final presentation of a writing-based project included the following comment about the interface of technology with curriculum.

> "For the young writer, it offers multi-media opportunities and emphasizes the valuable awareness of an audience. The 'under-construction' nature of web pages also helps the author focus on writing and research as process that, at its best, involves revision, collaboration, and feedback."[K-12 teacher]

Of the 20 IU projects, 14 projects worked with students either directly or indirectly. Thirteen projects also targeted teachers and teacher development. Of the student-centered projects, five directly assessed student achievement in subject matter content. These projects reported increases in student achievement in the areas of literacy, art, science, and technology. The distribution of IU projects and their primary target audiences are presented in Figure 1.

FIGURE 1. The distribution of primary target audiences across IU projects.

		Students		Teachers
		Target	Assess	Target
1	The Arts:Cal Performances	X		X
2	Arts (Art History)	X		X
3	Personal Pathways			
4	EAOP	X	X	X
5	Literacy MOOs	X	X	X
6	KIE	X	X	X
7	EECS	X		X
8	LHS			X
9	MESA	X		
10	Materials Science	-	-	-
11	Hearst Museum			X
12	CPAstrophysics			X
13	CHAT	X		X
14	ISLAM	X		X
15	Cal Heritage	X		X
16	CityBugs	X		
17	ISTAT	X	X	X
18	Spanish/BLL	X		
19	IURD	-	-	-
20	FIRST	X	X	
	TOTAL	14	5	13

4. Attitudes about subject matter

Data collected from focus groups, individual interviews, final project reports, micro-assessments focusing on subject matter, and teacher presentations revealed consistent agreement that the attitudes of students toward the subject matter were enhanced.

> "...kids [are] taking more pride in their work product. Whereas before they [students] might just turn in something... the world's going to see it now. It makes a big difference in the pride they take in it. I think it's going to make an effect." [UC Administrator]

> "Students' images of science were dramatically changed by working on the [IU pilot] projects and meeting Cal scientists. In one class, for example, only 13% of the students described science as an evolving field at the beginning of the school year. After their work [on IU pilot project], that percentage increased to 60%, indicating that about half of the students learned how scientific understanding advances over time." [K-12 teacher]

One commonly described pattern was that many students enjoyed the move away from more traditional types of learning.

> "An engaging project topic, use of Internet, and a more active and scientific style of inquiry that involved researching and debating their own opinions proved to be powerful for the range of students." [K-12 teacher]

5. Role of Internet technology in enhancing student achievement

Student survey data revealed changes in their perceptions of the benefits and disadvantages of Internet technology. The largest change was obtained in students' perceptions of how computers make work easier. There was a 7% increase in the number of students who perceive that Internet technology makes work easier. With regard to Internet technology disadvantages, the largest difference revealed that more students had come to view Internet technology as not being readily accessible (due to hardware problems, availability, etc.). Students also changed in their perception of the usefulness of technology. By the end of the projects there was a 25% increase in the number of students who responded that the Internet allows for the acquisition of research information. Also, the nature of their perceptions regarding usefulness of technology also changed. For example, before the project the most common answers of Internet technology's utility were research/information, help with school work, and ease. After the project, in addition to the responses above, students also stressed the use of Internet technology for communication purposes.

Teachers also revealed changes in their perceptions of the role of the Internet for school achievement. Before the project 36% of teachers indicated that there was no role for the Internet, and 15% thought that it had a "little" role. After the project, 25% of teachers indicated that Internet technology enhanced academic achievement through helping students gather research and information. Some of the other uses which teachers revealed were e-mail, and presentation of information.

Yet when the use of technology in curriculum seemed to affect student achievement, it was often described through it's potential for interactive activities, (i.e., the role that an interactive web site can take in the classroom).

> "I don't think that there's anything that can really duplicate the excitement of knowing that someone's doing this right now and I'm looking over their shoulder, and then you can do things like... kids can now gather data and make their own interpretations and challenge the scientists." [UC faculty]

This perception was also reiterated in projects' accounts of the role that technology took in the classroom. The underlying theme across these accounts is that the use of Internet technology promoted increased motivation, and participation among a range of learners (high to low achieving students). One project coordinator noted,

> "There were a number of kids that were completely 'checked out' of science class, that didn't participate in regular activities and they were our stars, some of them

were. In terms of really doing research, and giving great debate presentations , or "ace-ing" the post test. For some of these kids they had never experienced this in school before, y'know, because it was a completely different sort of motivation for them, and a different opportunity to succeed than the traditional go learn something and go write down the answers on a sheet of paper." [Pilot Project Coordinator]

B. Building a Collaboration

1. Role of Technology in Collaboration

a. Strengths and Weaknesses: Across all groups (teachers, coordinators, faculty, and UC students), trends in the strengths and weaknesses of Internet technology in collaborations were found. The most common strength reported for all groups was the convenience of the Internet. It allowed for fast, easy, asynchronous communication among partners and wide dissemination of information. The Internet also provided K-12 partners access to university resources and information through the World Wide Web to help with curriculum design and planning.

> "...having the face to face [interaction] is extremely valuable because then after you [have discussion] like this then we can go back and work on our separate things and send a flurry of e-mail back and forth. If we hadn't had this kind of discussion first, that would have made it a lot more difficult to get started on the rest of the decision making process." [IU Management]

Identified weaknesses were also similar across groups. They all spoke of the impersonal nature of technology — how technology cannot replace the value of face-to-face interactions and how miscommunication can occur through the written word.

> "It got to the point where you had these endless e-mail messages [that] were more of a hindrance than an enabler for us. So we just finally realized we had to just talk to her, just had to have some at least ear-to-ear contact." [Pilot Project Coordinator]

Another agreed-upon weakness was the unavailability of technology, including access and reliability. The availability of technology in the schools was a constant challenge, which in turn created problems of teacher access to e-mail for communicating with their partners. Focus groups also illustrated this difficulty. Project coordinators, IU administrators, and faculty found that with those who were already e-mail users communication could be carried on that way, but with teachers and people who did not have convenient access or experience with it, there was not enough motivation to check their e-mail everyday and alternative means had to be found, such as telephone calls, face-to-face meetings, and faxes.

> "...one of the simple tools for collaboration is really that every teacher should have a computer with e-mail capacity in the classroom, and ideally it would be really [great] if every teacher could have a computer at home that had e-mail. Because many teachers are able then to go home and do their work when they're out of the classroom. To actually communicate, that's the biggest thing." [K-12 Teacher]

> "E-mail was used for logistical coordination of the group activities -- almost exclusively by individuals in the group who were e-mail users at the start of the project. Now that many of the technological hurdles have been resolved and working relationships have been established, using electronic communication to engage in subsequent curriculum design could replace some of the face-to-face meetings." [Pilot Project Coordinator]

b. Between K-12 and UCB Partners: E-mail was reported to be utilized quite often as the means of communication between K-12 and UCB partners. Eighty-one percent of coordinators reported that e-mail contributed to relationship building and 63 percent of teachers said that e-mail was the main method of communication. However, it was found that the biggest obstacle with Internet technology in building K-12/UCB relationships was the differences in infrastructure and culture of technology use between the schools and the university. Thirty-eight percent of the coordinators acknowledged that e-mail, as a means of relationship-building, was hindered by factors such as technology problems at the schools and teachers' pattern of use. Teachers commented that they wished coordinators would simply call instead of sending lengthy e-mail messages that they may check on a weekly instead of daily basis. Classroom teachers did not have the opportunity or access to computers as part of their typical day to check their e-mail regularly as compared to individuals at the university, where technology is part of the culture. University personnel needed to understand the different type of restrictions that are placed upon teachers and find alternative means of communication with K-12 partners, such as phone calls and more site visits.

> "I'd have the [hardest] time trying to get [the project coordinator] or some of the other people I work with to pick up a phone and call me...There were a couple of times where I said 'will you turn the machine off and pick up the phone and call me?' I don't think [using this technology] is as efficient as some of the older forms of communication. I think we need to go back to picking up the phone more." [K-12 Teacher]

Additionally, whether the outreach project is technology-based or not, coordinators felt that site visits were a necessary part of the relationship building with the teacher and students and an opportunity to gain a greater understanding of the school culture, the time demands of the teacher, and make adjustments accordingly. Technology was seen as only one component of an overall project that includes a human relationship.

> "I think that you almost have to be part of the landscape there in order to sort of really understand what the culture was about, how people do interact, and just how the whole thing fits together, and then how the university fits into that system. But I also spent an inordinate amount of time on the phone, nine o'clock at night with the teacher, which again goes back to the issue of how do you make good use of the teacher's time. For me at least, I always felt like I was trying to find a balance point between being able to really make my needs understood, what we could do, exciting things that we could do, but not be so overwhelming as to tax her and that's kind of hard." [Pilot Project Coordinator]

c. Among UCB Partners: Because of the university's familiarity with Internet technology and culture of use, it is not surprising that technology was seen as entirely positive in building relationships among partners at UCB. UC students felt that e-mail was "essential" because it reaches vast audiences. The UC faculty commented that e-mail was fast, convenient, and enabled collaborative work. Finally, 94% of the coordinators felt that e-mail enabled easier communication and 50% acknowledged the benefits of the Web for collaborative work and access to information. These comments reflect the widespread use and connectivity of the network on the UC campus.

> "So in the last five and a half years, the [university] network has more than quadrupled. We're very close to [being a network university] now. You'll find connections in every building, and on most people's desks and faculty, and now every dorm room has ethernet connections, and so on. But that's a relatively recent occurrence. Five years ago there were a lot of people that were into it, but it was not everybody. And when it's not everybody, you then can't use e-mail to communicate, you can't use the Web to put things on and so on, because it's just

> getting at a few. So in the last five years, tremendous changes have happened to the connectivity and the way that we do business on this campus." [UC Administrator]

d. Among K-12 Partners: In comparison to the use of technology in building relationships among UCB partners, only 17 percent of teachers reported that they use e-mail or technology to communicate or collaborate with one another. Twenty-nine percent felt that there was no change in their working relationships with each other. This is once again attributable to the culture of schools with technology availability, access, and use.

> "...in the university setting a lot of your communication is done through e-mail, so that you e-mail each other back and forth like it's nothing. But in the high school setting, we don't spend a whole lot of time e-mailing each other as our means of communication. We will pick up the phone and will call someone and ask when to do something...but e-mailing is not our main [method of communication] because we know sometimes the systems break down and it's just not consistent enough." [K-12 Teacher]

2. Elements Necessary in Building and Sustaining a Collaboration

Individuals who work in two very different cultures such as the university and the K-12 schools bring different backgrounds and knowledge to a collaboration. Through their experiences in the IU Project, it is possible to ascertain elements that are necessary to build and sustain a collaboration between different institutions.

When asked to list factors necessary in building a collaboration, teacher responses indicated the following top five factors: time (18 percent of responses), shared goals (17 percent), communication (14 percent), commitment (13 percent), and finally, availability of technology (11 percent). After their participation in the project, teachers felt that time (10 percent of responses), shared goals (13 percent of responses), communication (14 percent), and commitment (14 percent) remained as necessary elements, but they also named money/funding (11 percent of responses) as something to consider. They felt that on-going funding for the projects was needed to sustain them within the curriculum, but they also discussed the value of being compensated for their participation through measures like paid release time for seminars and meetings. Teachers' participation in projects such as IU goes above and beyond their regular duties in the classroom, and their time is extremely limited and valuable. Compensation for their time as well as being able to attend meetings during their regular school day were appreciated by teachers, and the compensation given was not about being paid but what it represented -- respect for them as professionals.

> "It's not even so much a matter of putting money in your pocket...it's kind of a respect thing...Your time's worth something."[K-12 Teacher]

It is interesting to note that at the end of the project, teachers felt that resources and technology were less crucial in building a collaboration. At the beginning of the project and during the planning stages, the technology infrastructure and resources were foremost of participants' minds as they thought about establishing the network connections in classrooms, buying equipment, and discussing ways to merge the curriculum with Internet technology. Through the year-long project and delays in getting the technology in place, teachers and coordinators found ways to work around the unexpected delays and still build a relationship. They appeared to have moved beyond the hardware issues and saw the Internet as only a tool for learning, and came to focus more on collaboration building through communication and having opportunities to meet during structured times for which teachers were compensated.

Pilot Project Coordinators' responses to the pre- and post-surveys also demonstrated similar attitudes. Both before and after the project, coordinators felt that the top five factors in building and sustaining a collaboration were commitment (32 percent of pre-survey responses and 23 percent of post-survey responses), money (14 percent of pre-survey and 15 percent of post-survey), shared goals (13 percent of pre-survey and 15 percent of post-survey), communication (9 percent of pre- and post-surveys) and respect (7 percent of pre-survey and 10 percent of post-survey).

Pre- and post- surveys from UC faculty and district curriculum specialists did not reveal any clear trends in what was necessary to build a collaboration. Their responses did lend support for the top factors identified by teachers and pilot project coordinators, such as respect, shared goals, time, flexibility, and communication.

Focus groups with teachers, coordinators, UC administrators, and K-12 administrators revealed even more information about how to build and sustain a collaboration. Based on comments from pre- and post- surveys and focus groups, the following appear to be crucial factors to consider in a collaborative outreach project like the IU.

a. Shared Goal: A shared goal is important in a collaboration because both parties need to be working toward a vision of what they want to achieve. If both sides potentially benefit, there is a greater interest and motivation to work toward that shared goal. Through comments on surveys and in focus groups, teachers reported that there needs to be a clear understanding of what the goals are, the goals need to be realistic, as well as long-term, and most importantly, the project should fill a need on both sides. Some teachers spoke of how the project fit with K-12 curriculum goals, and in some cases why it did not. Students in projects where shared goals were developed to address curricular frameworks, were able to use technology to fulfilled academic requirements. Some projects helped teachers promote their philosophy of learning — children should search out knowledge rather than be given the information, which was done through teaching children how to search the Internet for resources. Pilot projects also filled a technology need in the classroom by giving students exposure to, and training with, computers and the Internet at a time when computer literacy and networks are being emphasized in school districts.

> "Our project covered two school goals...One was to fulfill a writing course goal that they have to make before graduation, and the other was a fine arts requirement. Because part of our class was an advanced creative writing, that was the writing portion of that, and art history was the other...The kids could take that class as an elective or as a requirement for art or as a requirement for writing. A lot of different ways to take it and utilize the class." [K-12 Teacher]

For teachers and classrooms where there was not a shared goal and vision of what they wanted to achieve, teachers felt that the project was less useful and less of a priority. Teachers had their own curricular agendas to fulfill, and given limited classroom teaching time, they needed to maximize that time covering material that is relevant to the classroom, school, and district goals.

> "It got to the point where Interactive University was really getting to the background...primarily because it did not fit directly with what my curriculum or what my classroom goal was...I'm looking forward to the coming year because maybe then I will have an input in either developing what I want it to be or the direction I want it to be...I had the computers in my classroom, I have the Internet access in my classroom, the only thing I can complain about is that I didn't find a fit for it." [K-12 Teacher]

Furthermore, it became clear in focus groups that UC Coordinators, IU Management, UC Administrators, and K-12 Administrators were also aware of the importance of shared goals and how the project should be linked with K-12 curriculum goals, standards, and frameworks.

> "There was a lot of responsiveness in the whole process with planning the IU project to make sure the projects were built with the needs of the school district and the students and the schools and teachers in mind...The project was meeting the [needs] of the school district." [K-12 Administrator]

> "It's just really clarifying what the needs are of the district, and what our needs [at UC] are in terms of trying to find a fit. Looking at all of our little restrictions and our needs, and looking at all the restrictions [at the schools] and their needs, where do we have that common ground? Where can we help each other come together?"[IU Management]

b. Time: Given the scope of what the IU Project was planning to achieve in the course of one and a half school years, it is not surprising that adequate time and a realistic timeframe were identified by teachers, coordinators, administrators, and faculty as necessary to build and sustain a collaboration. Focus group participants seemed to agree that a large collaboration like the IU takes time to set up so that there are not as many short term results as there may be in the long term.

> "I think the scope of what we're doing [in two years] is exactly the same as these five year projects that [are being funded]. We were attempting to put forth something that would be meaningful to both the university and the district...it was not really meaningful to think that we could start everything up from when we got funded and within two years be completed with the project." [IU Management]

Furthermore, given the schedules of participants at UC and K-12 schools, many felt a need to balance the time demands of the project with their regular job duties that needed to be fulfilled. Time needed to be set aside for seminars, meetings, collaboration, curriculum planning, and training. This was a common theme for faculty, coordinators, and teachers. Administrators were sensitive about the demands they placed on faculty and coordinators, and coordinators were, in turn, sensitive about the demands they placed on their teachers.

> "I think the biggest problem that we face is trying to find time for participants. A campus like Berkeley places so many demands on all of the participants, whether you're a student, a faculty member, or a staff member, that trying to find a share of people's minds and energies is really the toughest challenge." [UC Administrator]

> "It's really, really hard when teachers are already up to here with [things] to do and you come knocking saying, 'well, would you like to do this too?'...As the year goes by, you know how much you can really ask for and how much you can really expect to get back." [Pilot Project Coordinator]

One accommodation for the time demands placed upon the teachers was to arrange for paid release time and Saturday workshops. Teachers in focus groups and surveys commented on how they appreciated the accommodations made for their schedules.

> "The time the teachers had was not part of their regular work and that was something that was facilitated by IU and if that hadn't happened, the project wouldn't happen. They told us a number of times if they didn't have the release time and the extra paid hours they would not have been able to do this because a teacher's time is just not set up to do projects this major during the school year, they just don't have it. That was tremendously helpful."[Pilot Project Coordinator]

c. Communication: Communication, in general, is necessary to ensure that all partners have opportunities to plan, discuss, solve problems, and agree on mutual goals and objectives. In short, it is a key means to building a collaboration and relationship between partners. Between K-12 and UCB partners, the necessary amount of communication appears to depend upon their specific role in the collaboration. UCB participants, such as coordinators and faculty members whose roles demand planning and activity coordination, agreed that weekly contacts were necessary. They acknowledged the importance of more frequent meetings in the beginning stages of collaboration in order to plan and agree on roles and goals. Coordinators found that professional development days and the face-to-face contact with all the UC personnel and K-12 teachers was essential to the planning or the project. It was important for K-12 teachers to have input in curriculum design so that their students' needs could be best served.

> "Curriculum design is aided by frequent face-to-face meetings. We had much to discuss when designing the new curriculum projects. We found face-to-face, monthly meetings along with many other informal visits at the school to be the best mechanisms for moving the designs along." [Pilot Project Coordinator]

UCB students who were tutors, mentors, or graduate student researchers in the pilot projects had a lesser role in planning with K-12 partners. Their limited involvement with those aspects of building a collaboration was reflected in their belief that only monthly contacts with K-12 partners were necessary.

Over the course of the partnership, teachers felt that weekly contacts became more important. On the pre-survey, 67 percent felt that monthly contact was enough and 28 percent felt that weekly meetings were appropriate. However, on the post-survey, an increased number of teachers felt that weekly contacts were more important (33 percent), and fewer teachers felt that monthly contact was sufficient, 46 percent. Although overall more teachers felt that collaborations could be built with monthly meetings, it is important to note that that number dropped after the nine month collaborative experience. They may have come to realize that a greater time investment is necessary to build a project. Furthermore, teachers may feel that monthly contact is more feasible than weekly contact because of their schedule and time demands. Collaborations in K-12 are taken on in addition to their regular teaching duties, and thus, their availability and time is much more limited.

> "Our project went well because we had a really...dedicated person at the university who was very good in terms of frequent communication."[K-12 Teacher]

> "The thing we built into our project was we met practically monthly with the UC Berkeley team so we had face-to-face all day meetings...that really worked out very well, that ongoing communication and dialogue going on there. It always kind of fascinated me that with all the intrusions and interruptions and field trips and assemblies, we always ended up on the same page. It was fascinating that it actually worked out." [K-12 Teacher]

Also noteworthy, a majority of teachers felt that UCB partners should have at least weekly contact with K-12 students, 54 percent of pre-surveyed and 54 percent of post-surveyed teachers, and a much smaller percentage (18 percent of pre-surveyed and 17 percent of post-surveyed teachers) felt that monthly contacts were enough. Teachers commented on the need for students to have contact with UCB personnel in order to connect real faces with the university. Some K-12 middle school students wished that the UC project personnel would have come to their school more frequently.

Collaborations not only occur between different institutions like the university and the school district, but also occur within settings. Among K-12 participants, teachers spoke of the importance

of having opportunities to network and share their experiences among their peers. Teachers were able to enhance their classroom practice, share resources like web sites, encourage other teachers to use the Internet, and discuss the status of their projects.

> "Collaboration among teachers can be very valuable. Project meetings were times to share tips and perspectives and to help each other with pedagogical or practical challenges – opportunities often lacking in day-to-day teaching" [K-12 Teacher]

Among UCB participants, they had a similar experience to K-12 teachers in discovering the value of collaborating among themselves. Although they found IU seminars and the formal presentations informative and appreciated the structured time they were given with their teachers, coordinators felt that conversations in which they could talk informally with each other about their experiences were even more helpful. Such opportunities allowed them to share their experiences, frustrations, and set-backs that all of them were dealing with and might not have otherwise shared.

> "I think [the seminars] were very useful, but...they felt more constrained...It could be simply the fact that we were all experimenting and didn't yet know the frustrations and problems and set-backs that we were dealing with were so universal, and maybe just sat there and kind of went 'hmmm...I should just listen.'" [Pilot Project Coordinator]

d. Commitment: A long-term project like the IU requires a certain level of commitment from both UC and K-12 participants in order to maximize the chances for success. On pre- and post-surveys, both teachers and coordinators named commitment as one of the top five factors necessary to build and sustain a collaboration. Commitment referred to perseverance in the face of obstacles with technology, follow through on promises, and most importantly, interest and motivation to make the project work from both sides. A problem that some projects faced was teacher turnover at their school sites. In focus groups, coordinators discussed how teacher turnover impedes progress because the K-12 partnership is disrupted.

> "The teachers went beyond what was set for them. One of the conditions that was really important for us was that we had to have a group of teachers who were very committed to this and what this type of project could do for their students through the whole thing. They gave a lot above and beyond, and without that kind of dedication, it wouldn't have happened." [Pilot Project Coordinators]

e. Respect: It is interesting to note that coordinators listed respect as a necessary factor in collaboration building, but teachers did not list it as one of their top five factors. From focus groups, it can be surmised that coordinators seemed to enter the collaborative relationship with an understanding that there are cultural gaps between the university and K-12 that need to be understood and that their K-12 partners have something to contribute as professionals to the process.

> "...recognize teachers as colleagues and professionals and...they're treated very well...Sometimes when you put the university into things they feel like the university's way up here and they're just teachers. But they [teachers] know what's going on in the schools." [Pilot Project Coordinator]

f. Funding: It is impossible to carry out a project like the IU without adequate and on-going funding for personnel and equipment. Money/funding was listed in pre- and post-surveys by the coordinators as a necessary factor in collaboration building. Coordinators were involved from the beginning with budgetary issues for their projects and the funding for their own positions. In focus groups, coordinators described the additional amounts of time above their appointments that they worked in order to keep their projects moving throughout the year. For teachers, funding was

listed only in the post-survey as one the essential factors. As the project progressed over the year, teachers understood the time required of them and the value of paid release time, the funding necessary to carry out their respective projects, the money needed to purchase equipment and provide training, and how this project might be sustained for another year. In focus groups, administrators from K-12 school districts as well as UC brought up the issue of funding in focus groups and interviews as a crucial issue in sustaining the project.

> "...if you don't have some money to bring to the table I think it's very hard to motivate people to do programs. If you're depending entirely on school funding, K-12 funding, and soft money, I think it's very difficult to sustain them. So I think that it's important to have some kind of budgetary support." [UC Administrator]

g. Leadership Support: For a project like the IU which involves participants from two systems, it is important to have the administration support and interest from both UC and K-12 school districts. It became clear through focus groups and interviews with teachers, coordinators, and administrators the importance of top level support. Coordinators discussed the need for K-12 districts to streamline the process for purchasing equipment and setting up the networks in classrooms, as well as providing a district server that could host the on-line curriculum. Teachers also talked about the need for the district to establish a reliable server so that they can have access to their e-mail and be able to use the Internet for curricular resources. They also believed that the administration should find a way to make technology more accessible in the schools, such as having computers in the classroom or better access to the school computer labs, have a technology support person on-site or in the district, and structure time in their day to check e-mail or search the Internet for resources – these were all challenges that teachers encountered at the school site during the course of the projects. K-12 Administrators felt that they could help to promote the project in the school district, help alleviate any challenges that arise, recognize the value of the Internet and promote its use, and provide money for the hardware investments in the schools. It is clear that for a project like the IU or technology-based curriculum to succeed, it takes much support from the district.

> "Does it become part of the fabric of the district, and the training of the district, and the professional development of the district, so that teachers know how to use these [new] tools and lesson plans...and whatever enhancements to enrich the curriculum? They all have to learn how to participate." [UC Administrator]

> "To work with the school districts, I think you have to have buy-in at the top levels of the administration as well as energetic commitment on the part of whatever schools you're in, which is probably leadership at the Principal level." [UC Administrator]

Based on interviews with UC Administrators, it was found that on the university side, support from top levels of the administration is crucial for promoting policies that support outreach efforts by faculty, garnering support from campus units, and publicizing projects to alumni and community members. University administrators can provide support for outreach efforts through their leadership and facilitation. Their involvement signals to the campus community that outreach programs are important, and they are able to bring together the right people to participate and help make decisions about the allocation of resources.

> "It is certainly a key role for leaders to play because everybody in a large organization such as the Berkeley campus takes a cue from what the leaders are really supporting. And if outreach is important, you should see it in the Chancellor, you should see it in the Vice Chancellor, and in the heads of various units, and you should see their support or else I think we would just be paying lip service to

various things. People are very smart, they see what their top leaders are interested in and they follow that lead very carefully." [UC Administrator]

3. What Needs to be in Place Before Beginning a Collaboration

Based upon focus groups and interviews with coordinators, faculty, teachers, K-12 and UC administrators, and IU Management, it became clear that in addition to the above elements there needed to be certain things in place at the school site and at the university before beginning a collaboration. At the school site, the following were identified as pre-conditions: a liaison between the school and the university to help with communication, lead workshops and training, assist in getting equipment and materials; schools and classrooms appropriately wired; all materials should be in place, especially technology; easily accessible computer lab and on-site technology support person; district server that is reliable and working; teachers who have adequate background in content area and technology. The most common concern voiced by all these groups was related to computer equipment and infrastructure. In a project like the IU which relies on available and working equipment and networks, it is not surprising that these were identified as pre-conditions.

On the university side, these were identified by the groups as being pre-conditions: coordinators to organize the activities and encourage classroom activities; adequate numbers of undergraduate mentors participating in the outreach effort; funding; a management team to oversee the entire project; personnel who are familiar with doing outreach and with technology training; a greater knowledge of what the technology situation is at the school sites and what types of programs are already in place.

C. Integrating Teaching, Research, and Service

1. Students Tapping UC Research and Faculty

In the outreach effort between the university and K-12 schools, it was hoped that students would gain new knowledge from their university representatives (i.e., project coordinators, faculty members, student tutors and mentors) about content area based on faculty research or about colleges and universities through their interactions with individuals from the university. From student post-surveys, 22% of the K-12 student responses indicated the learning of new knowledge about colleges and universities. This knowledge ranged from what a college campus looked like to college requirements to what type of work they would be expected to do. Another 9% of the responses reflected a gain in Internet and computer skills, and 7% of the responses reflected new content area knowledge. It is speculated that there was a greater number of students who gained content area knowledge and computer skills, but due to the open-ended nature of the questions those areas were not specifically tapped. This is supported by teacher focus groups and teacher presentations of outcomes from their pilot projects. Teachers shared that students were able to utilize faculty research through the web-based curriculum, have opportunities to e-mail undergraduate students at UC Berkeley, visit the Berkeley campus during science fairs and weekend campus tours, and read faculty writings. Furthermore, on the post-survey, UC students felt that the project served K-12 students by increasing their awareness of UC Berkeley and the sciences and got them excited about college and the sciences.

"I think it's a good opportunity for students, especially the ones who are going to go to college...This week we are going to have one of the UC Berkeley professors [come] to our school and talk to my class about electronics and [other topics]. So I think that's really a good thing, for kids to be exposed to professors at [their] age, [kids who are] wanting to go to college and not knowing what to expect." [K-12 Teacher]

2. Were Teaching, Research, and Service Brought to the Schools?

Based on post-survey comments, UC faculty felt that research had been brought into the schools through Web sites that connected to campus units and opportunities to visit classrooms to fulfill community service duties. Thirty-three percent of the teachers on the post-survey felt that the university's role of service had been realized, versus 21% who felt that it had not.

More revealing were comments from focus groups and interviews with the faculty, teachers, and administrators, as well as teacher presentations. One faculty member felt disappointed that the role of service was not fulfilled to her expectations due to technology problems. This faculty member reported that the project's goal was to connect students with faculty through e-mail and interactive chat sessions that did not take place because of lack of technology in the classroom. It was acknowledged that faculty did not have the time to go the school sites, and it was hoped that with Internet connections, they could leverage faculty time and have an interaction. This is contrasted with another faculty member who spoke about being able to visit classrooms, present research in relation to their experiences, and watch children learn first-hand. Administrators discussed in focus groups how important it was for university participants to visit the school site and be actively involved in the classrooms.

> "This [has] given us a focus and let us have this opportunity to [outreach], and a lot of departments that have never had any outreach [or] been to communities before are doing that and it's a totally new thing for them. And instead of being an ivory tower they're sharing resources and learning from other people's experiences in the district. And it's been really invigorating for all of us." [IU Management]

Teachers, through their presentations, shared how the university's role of integrating teaching, research, and service was realized. Teachers recounted that students read the works of faculty members and then had the opportunity through interactive chat sessions to speak with faculty and other distinguished individuals about their research and questions. Teachers also valued university participants visiting the K-12 site.

> "I was very impressed that anyone from the university would come out and join us on a field trip or make a presentation to a class and show slides. That was very well received by all of our teachers as well as the kids, it broke down some barriers. So I hope that kind of thing continues." [K-12 Teacher]

3. Use of Technology in Integrating Teaching, Research, and Service

Given faculty's time constraints and obligations to the university campus, technology can play an important role in helping to integrate teaching, research, and service. Internet technology can leverage faculty's time, resources on campus, and help in the outreach mission to get these resources into the community. Through faculty and UC administrator focus groups, it became clear that they are willing to utilize technology resources to fulfill the outreach mission of the university.

One method is through e-mail in which faculty could take a small amount of time each week to answer students' questions or provide feedback to students in a way that could leverage their own expertise with a reasonable commitment on their part. Another possibility is through development of faculty web pages that would post their work and research, which students and teachers could access. Faculty and administrators also raised the possibility of using chat sessions or asynchronous threaded discourse to have more in-depth interactions with students than via e-mail. Through such technological resources, faculty may also be able to mentor students.

> "It is a big investment for them [faculty] to go out to the schools and I'm not sure that it's the best use of their time. And some faculty want to do that, and we want them to do that, but they have so much to offer in curriculum development, so much to offer in getting these web resources going, so much that could be offered with this vision that we had [of faculty interacting with students through the Internet], that if a student has a question in physics or they have a question about how to apply physics to their design problem, faculty members could respond." [UC Faculty]

4. Policies to Promote the Integration of Teaching, Research, and Service

To promote greater faculty involvement in outreach efforts and the integration of their roles of teaching, research, and service, campus-wide policies, strategies, and incentive structures need to be in place. Based on interviews with UC Administrators and faculty, it was clear that faculty would like to take a greater role in outreach but need accommodations made for such efforts. One suggestion that arose was a bonus incentive package as part of the financial structure. Faculty who do this type of work with K-12 are taken away from their own workload, and this would provide some kind of stipend or bonus and the recognition that goes along with that. Another structure that could be tapped is the release time structure so that faculty could get some of their workload decreased to work on projects like the IU. Another UC Administrator felt that the reward structure for individual performance can help to promote participation in outreach. By building it into the reward structure, involvement in outreach will be seen by faculty and staff as a fulfillment of the university's responsibility and part of one's performance and what one does, and not as an extracurricular activity. A UC Faculty member also supported building outreach into the tenure and reward system. Aside from campus-wide strategies and incentive structures, it is important to make outreach easier for people to do, and technology appears to be the conduit for such outreach.

> "We think that through very innovative uses of the Internet, that's exactly what we can do – find ways that faculty and staff and more students can have a bigger impact and make it easier for them to get involved in K-12 activities in a meaningful way that really could then scale upwards. So having policies around that will allow people to participate in these activities as part of their job is certainly very important." [UC Administrator]

D. Technology

1. Infrastructure: What Needs to Be in Place at the K-12 Site for integrating technology into the curriculum

From the discussions above, it is not surprising that issues of infrastructure were a recurring theme in project implementation. It is summed up by a K-12 Administrator -- "We have to have the material, the hardware, the connections all in place." This sentiment was echoed by other K-12 administrators as well as UC administrators, coordinators, teachers, and students. There were delays in getting infrastructure in place, problems with servers, connectivity and classroom wiring and with Internet access even when classrooms did have computers. This often caused frustrations on the part of teachers, students, and coordinators as the real goals of the project were prevented from being realized according to the original timeframe.

> "I still hadn't gotten on the Internet by the last week of school so that a lot of my kids were frustrated and we had to [juggle] with other scheduling...It's just too frustrating to write curriculum, research, do everything else, and then not have availability to use it." [K-12 Teacher]

> "Among the challenges, the major one faced was the inaccessibility of technology. Like other projects, technology didn't arrive until really far into the school year. And so we missed out on opportunities to mesh with the curriculum which was the foundation of our whole project." [Pilot Project Coordinator]
>
> "Internet connectivity and computer access by teachers and students has generally not been in place to the level required for the pilot projects to proceed on their original timelines. This issue has required extensive communication and facilitation between the IU management team, pilot project participants, the school personnel, and the district personnel. A large amount of management time has had to be spent facilitating this interaction." [Pilot Project Report]

Getting the K-12 classroom properly connected, equipped, and maintained, as well as teachers trained, are major challenges and ones that the school district will need to resolve over time.

2. Technical Support Necessary for the IU Project

Technical support was a recurring issue for teachers and students. Network and hardware problems were reported by both groups in pre- and post-surveys as some of the top difficulties they have had in working with computers. In focus groups, similar concerns arose from coordinators, administrators, IU management, and faculty. Network and hardware problems can delay projects' curriculum plans if they are not dealt with immediately and effectively. There are few on-site technical support people or trouble shooting teams in the district that can immediately solve such problems. Often there is just one computer resource person in the school who is also a regular classroom teacher, and the demands on that teacher are great. Teacher and coordinator post-surveys indicated that they needed on-site technical support or someone within the district because the support they did receive was insufficient or non-existent. In every focus groups with teachers, coordinators, administrators, faculty, and management, this need was voiced. There were difficulties with the district e-mail server, inaccessible technology, computer hardware problems, accessing and sending e-mail, connectivity, etc.

> "They need to have someone on-site who can just sort of 'de-snag' these very small things. It doesn't mean having to download, take everything off and put everything on, and total re-installation...in some cases, a very small adjustment. But without help, they end up having everything down for a week, which is not really a good use of anyone's time or technology." [Pilot Project Coordinator]
>
> "The whole support piece is lacking. We don't have technical support. So I find a lot of our curriculum people spending a lot of time on technical issues rather than helping the teachers really think about curriculum and curriculum integration and curriculum development...That's been something that has pointed out the need for us ... to really expand our whole support to technology at school sites." [K-12 Administrator]
>
> "I couldn't get my e-mail going so that I had to really search for somebody down at the district...I asked somebody, they couldn't solve my problem, I asked somebody else, they couldn't solve my problem, I went and I took everything off the computer, put everything back on, and it still didn't solve my problem. I got more memory and that didn't solve my problem." [K-12 Teacher]

Some projects solved these types of problems by having the coordinator, liaison, undergraduate student tutors, or more proficient K-12 students act as troubleshooters. It is clear that a more formalized method of on-site technical support is necessary, e.g., an on-site individual, someone that serves the entire district, or a help line.

> "Who's going to get that computer up and running, that Internet page on that screen? We need to have somebody that they [teachers] can call, or maybe if we train a person at every single school site so that they become the on-site support person. One way or another we have to have a way for teachers to get a quick response to their needs, to have someone help them with these kinds of problems." [K-12 Administrator]

3. Technology Training Needed for the IU Project

Considering that each pilot project's curriculum was planned using the Internet and computer in some way, it became necessary to provide technology training for students, teachers, and coordinators. Pre-surveys indicated that both teachers and coordinators wanted training in how to use the Internet and web page authoring and design, and both groups indicated a desire for training in curriculum design involving the Internet. In addition, teachers wanted training in how to use various applications and programs, and video conferencing. Post-surveys showed that teachers and coordinators did receive training in web page authoring, Internet use and search engines, and applications and software. Students also received training in how to use the Internet, how create web pages, use e-mail, and how to use applications and programs. It is interesting to note that of the student responses, 28% reported that no training was received; in those cases, individual projects may not have provided direct instruction, or because of problems in getting computers set up in classrooms the students did not have access to computers or technology. Students in the post-surveys indicated they wanted advanced training in web page design and search engines, and 24% of the students said they did not want any other training since what they received was sufficient. It is especially interesting to note that in the teacher post-surveys about what type of training they wanted but did not receive, the teachers wanted *more* training on web page authoring, *more* on software applications, and *more* of everything like hands-on training, after school workshops, and on-line library reference searches. This can be interpreted as either that they did not receive sufficient training or that their interest in the Internet was peaked and they wanted to advance their skills. Teacher focus groups lend support to the latter explanation that they wanted additional training to advance their computer literacy. They spoke about how workshops were "excellent" and "absolutely fantastic." They did indicate in the focus groups a need for workshops on troubleshooting so they could efficiently solve their own computer problems. It is important to note that Internet and computer training is a slow process but one that is critical to the success of project like the IU.

> "It's a really big deal to use [technology] effectively in the classroom, and...integrat[ing] the use of the technology and [curriculum] well is a really hard thing to do...We found that it actually took a lot more hands-on time with the teachers to get them comfortable with their role changes, and then even throughout the project we were still doing a lot of actual teaching, while they were seeing what it is, working with it, getting comfortable with it." [Pilot Project Coordinator]

> "It is essential that teachers, other K-12 personnel, and campus personnel, all be brought to the same high level of competency in the use of Internet technologies." [Pilot Project Report]

4. The IU Project's Impact on Technology Use

Because Internet technology and computer use are integral to the IU Project, it is expected that students' and teachers' pattern of use, type of use, and perception of its value will have changed after participation in the project. From pre- to post-surveys, students who used the Internet two to three times per week increased form 19% to 28%. Daily users also increased from 17% to 28%. Those students who began to use the computer with increased frequency appear to have come from

the weekly use group and the "other" group which includes infrequent and sporadic users -- as weekly users decreased from 16% to 7% and the "other" category decreased from 22% to 5%. It can be surmised that the project increased the frequency of use for those students who had already had some interest in the Internet and computer before the project. The percentage of students who never used the computer remained the same at 19%.

Students' type of computer use also changed from their involvement in the project. Pre-surveys indicated that students used computers for the following uses, in descending order of frequency (students were able to choose multiple responses): 65% of students reported they use the computer for games, 47% for the World Wide Web, 45% for word processing, 38% for educational CD ROM's, 35% for e-mail, 32% for Internet chats, 8% for Usenet groups, 6% for other uses such as programming or Web page design. Post-surveys indicated that students demonstrated this pattern of use: WWW (63%), games (62%), e-mail (54%), word processing (47%), Internet chats (37%), educational CD ROM's (37%), Usenet groups (12%), other uses (9). This demonstrates a trend in the increased use of the Web, increased e-mail use, minimal increases in Usenet groups and Internet chats. All other uses remained approximately the same from the beginning of the project until after the project. What this indicates is the project increased Internet use in a multitude of ways – means that the pilot projects utilized in their curriculum design (world wide web, e-mail, Internet chats). From pre- to post-surveys, there was no change in students' perceptions about the helpfulness of the Internet.

Teachers also demonstrated changes in their pattern of use. Post-surveys indicated an increased percentage of teachers using the computer/Internet daily, from 69% to 79%, and decreased percentages of teachers using the computer two to three times per week (18% to 4%), once a week (5% to 0%), and infrequently or sporadically (5% to 0%). This can be interpreted as the IU Project having an impact on teachers' use of the computer and Internet through the emphasis on e-mail communication, web-based curriculum, and computer training. Regarding teachers' types of use, there were decreases in all types of computer use, and an increase in Internet chat use, from 5% to 13%. Overall in pre- and post-surveys, teachers used computers most commonly for word processing (92% pre- and 83% post-survey), followed by e-mail (90% and 79%), WWW (87% and 71%), educational CD ROM's (59% and 46%), and then games (28% and 21%). It appears that teachers have frequently used the computer in one form or another, and while receiving Internet training and access through IU, it did not have an impact on teachers' types of use since computers were being used at relatively high percentages in the beginning. The IU Project did impact their views about the helpfulness of the Internet – 38% of teachers in the pre-survey felt it was "extremely" useful as compared to 62% in the post-survey.

Each Pilot project utilized one or more technology tools in it's activities. A goal of IU was to identify Internet tools that might be most effective for teaching and learning as well as the conditions for it's effective use. A matrix of the technology tools utilized by each project is presented in Figure 2.

FIGURE 2. Technology tools used by each project.

	Research Web Recs.	Student Pages	Develop Web Curr.	Email/ Listserv	Video-Conf.	MOO	Other
1 The Arts:Cal Performances	X	X	X	X			LIVE
2 Arts (Art History)		X		X			LIVE
3 Personal Pathways	-	-	-	-	-	-	-
4 EAOP	X		X	X			
5 Literacy MOOs	X			X	X	X	
6 KIE		X	X	X			
7 EECS			X				

8 LHS	X		X (teach)	X			
9 MESA			X				
10 Materials Science	-	-	-	-	-	-	-
11 Hearst Museum			x	x			
12 CPAstrophysics	X			X			
13 CHAT		X	X	X			
14 ISLAM	X	X	X	X			
15 Cal Heritage	X	X	X	X			
16 CityBugs		X	X	X			
17 ISTAT	X		X	X			
18 Spanish/BLL		X					
19 IURD	-	-	-	-	-	-	-
20 FIRST	X		X	X			

E. Procedures and Methods

1. Events and Activities

A series of IU events and activities were coordinated in order to select projects, introduce participants to the IU model, and allow planning time between K-12 and university participants. These events and activities included the initial demonstrations whereby teachers could select and decide to apply for a project, the application process which was used to select teachers, a retreat which allowed for projects to begin planning, and closure events with pilot project showcases. On the surveys participants were asked to rate the usefulness of the aforementioned activities on a scale of 1 to 5, from extremely useful to not at all.

Demonstration activities were rated by teachers, coordinators, and faculty. Teachers most often described the initial demonstrations has being useful (33%). Some comments from teachers who felt the demonstrations were useful included, "provides insight and incentive," and "unclear about project aims." Coordinators also most often described the demonstrations as useful (44%), noting that they were "necessary," and "interesting." Finally, faculty also most often described the demonstrations as useful (40%).

The application process was also rated by the same audiences. Teachers most often rated the application process as useful (26%), noting that is was "good for establishing level of interest [of the applicant]". Coordinators most often rated the application process as useful, yet their remarks noted some flaws with the process. Some of their comments included that the process should be more selective. All faculty surveyed found the process useful. They described that the process helped to get concepts together, and provided some initial insights into K-12 curriculum.

Finally, the retreats were also rated for their usefulness. Teachers most often rated the retreats as very useful (23%). Coordinators most often rated the retreats as extremely useful (32%), noting that it "started dialogue" and "helped put the project in concrete terms". Faculty most often rated the retreat as extremely to very useful (40%).

2. Personnel & Management

Interactive University personnel were also rated on their usefulness by project participants. Personnel included Interactive University pilot project personnel (coordinators and university staff), management and liaisons.

By the end of the project, teachers most often rated Interactive University pilot project personnel as extremely useful by teachers (63%). Management were most often rated by teachers as useful (29%). Liaisons were most often rated by teachers as extremely useful (29%), noting that they often went above and beyond the call of duty.

Pilot project coordinators rated management as useful (38%), and liaisons as extremely useful (44%).

3. Decision Making

Decision making regarding the selection of teachers and projects occurred early in the collaboration process. The selection of sites and teachers was the result of collaboration among the administrative planning team. This team included K-12 administrators, as well as Interactive University management. Within focus groups the team members, coordinators and liaisons discussed their perceptions on the selection process and the effects of early decision making.

Most often participants across these three groups (administrative team members, coordinators, and liaisons) found that the results of early selection decisions had not been optimal. While administrative team members described that the process had tried to include articulate teachers and a diverse range of schools, these were found to be insufficient criteria upon later consideration. Given the teacher turn-over rate and consequent delays, participants recommended that the selection process should be more stringent. Specifically, teachers with more developed technology skills should be selected. Liaisons expressed the need to play an active role in early decision making to help avoid these pitfalls.

4. Evaluation

Evaluation occurred at both the macro, project-wide level as well as at the micro, project-specific level. Surveys were developed to address the macro questions, as well as the coordination of focus groups with key individuals. Projects were asked to complete their micro evaluation through final project reports. Individual projects were assisted in the development of their micro evaluation through initial meetings during the summer or at the beginning of the year (i.e. development of pre and post assessment measures), and the provision of assistance upon request throughout the year.

In interviews and focus group discussions among university administrators and coordinators the importance of evaluation was noted. Specifically, individuals within these audiences described the importance of pre-evaluation prior to the implementation of a project. They described the importance of assessing students' skills prior to the onset of activities in order to measure change. This skill was not always a part of the repertoire of knowledge base for project coordinators, and the challenges of implementation were discussed.

> "So the challenge has actually been the time to do things at a slower pace so you get all the pre-steps. Evaluation is a big challenge. These projects are all so unique that you can't have a real standard evaluation plan. A big challenge with this type of project is when you work on curricular enhancements, it not always clear the impact on students can be well measured."[UC Administrator]

Comments from Pilot Project Reports revealed the importance of conducting focused investigations and allowing sufficient time to assess student achievement. Also essential was the availability of dedicated expertise and sufficient support from graduate students for the conduct of project evaluations, and the importance of providing opportunities and support for UCB and K-12 participants to become "reflective practitioners" in the context of educational outreach.

F. Overall Experience

1. General Outcomes of Collaborative Relationships

Participants were asked about the outcomes of the K-12/university collaboration, as well as the outcomes of collaborations that resulted within their own institutions. Teachers, coordinators and faculty were surveyed about the results of their collaborations, and the perceived usefulness of the collaborations. Focus group questions for coordinators, teachers, and faculty asked about the outcomes of the collaboration, including probes about unanticipated outcomes and lessons learned.

Inter K-12/UCB: Survey responses about outcomes directly related to school-university collaboration spanned from teachers' professional growth to project administration. Teachers most often pointed to the following collaboration outcomes: innovative curriculum ideas (21%), enhanced student achievement (21%) and increased technology competence (18%). Other outcomes included the perception of growth as a teacher, and of the university as a resource. Within focus groups both teachers, and K-12 administrators in the administrative planning team discussed the outcome of teachers' growth, and changes in teachers' perceptions of the university. One K-12 administrator noted,

> "From what I hear, some of the teachers are feeling much more comfortable with talking to university people; they're feeling a bit more comfortable about coming over here, and they see UC Berkeley is more human in scope and that it's really not a place where you're not welcome." [K-12 Administrator]

Coordinators most often mentioned that they had gained a greater understanding of K-12 curriculum when asked about collaboration outcomes (12% of responses). When asked to describe what was useful about the collaboration, 32% responded about their greater awareness of K-12 curriculum. Faculty also revealed that they had gained an awareness of K-12 curriculum. These gains were described by university participants in terms of understanding curriculum constraints, as well as in terms of students' levels of knowledge and experience.

Focus groups and interviews held across the administrative planning team, university faculty, and university administrators revealed lessons learned in the administration and coordination of the IU Project as a whole. Lessons that were learned included: (a) the need for a longer time frame in which to conducts projects such as IU, (b) the need to focus on a smaller number of pilot efforts, and (c) an awareness of the on-going nature of the collaboration. For example, tasks such as the development of the infrastructure at the school sites, and the integration of technology with the curriculum called for more time than the two years allotted.

> "It's really going to take time for these things to smooth out for the right kind of personnel to be in place for it to be truly integrated so you can seamlessly integrate technology into an already packed classroom situation. "[Pilot Project Coordinator]

Twenty projects received funding and were implemented throughout the course of the Interactive University Project. Focus group and interview sessions revealed widespread agreement on the need to focus on a smaller number of clearly articulated projects.

> "... for the [IU] project to really have an impact, one can't have as many different individual projects. There has to be some, at least some, family identity asserted between some of the different projects. There comes a point where you really have to ... decide to focus on the most successful efforts, I think, to make an impact." [UC Administrator]

Coordinators and UC faculty revealed that they perceived their experience on the IU project as a process of continuous growth and change. These participants described that the foundation had been set for further improvements, and advancements to be implemented. A variety of lessons learned contributed to the feeling that with additional time and investment, greater outcomes could be realized.

> "Well, I think the Interactive University Project is a tremendous project· I do think that our work has only begun. And so my big message and my big hope is that it will continue one way or another, and it's important that this is a foundation, but that we continue to grow [on] it and build on it." [Pilot Project Coordinator]

Intra K-12: Within the K-12 community, teachers most often described a sharing of ideas/knowledge among students through the projects (50% of responses). Students were observed asking each other for advice on the computer, Internet searches, or through peer tutoring as well as sharing knowledge with each other in team groups. Eighty percent of teachers described that teacher-student interactions were affected. They described how the project allowed them to take the role of facilitator and advisor to students' learning experiences (17% of responses), and by students becoming more independent in their learning (17% of responses). Among teacher-teacher interactions, 38% of teachers described that they shared resources and ideas with each other.

On a larger scale, K-12 administrators also noted that the choice of the Interactive University Project to work with two school districts created a unique opportunity for the two K-12 institutions to work together. This collaboration between the two school districts allowed for the mutual sharing of lessons learned, and the observation of alternative methods of implementation. As one K-12 administrator described,

> "I think that there's been a lot that has been gained from working together and implementing this project, and seeing how people do it elsewhere. I feel a lot has been gained for me and for technology in our district by what we've learned from [the other school district]. I think that's really strong." [K-12 Administrator]

(*Intra UCB*) Within the UC Berkeley community, the most common response of coordinators on the project was that an established network was created for future collaborations (50% of responses). Another often described result of the collaboration by coordinators was shared ideas and resources among university colleagues.

a. Unanticipated Outcomes

Through their experiences on individual projects teachers engaged in new areas of curriculum development, received exposure to the university and it's resources, and had opportunities to engage and/or collaborate with other teachers. These issues were addressed by focus groups through discussion of project outcomes, including unanticipated outcomes.

K-12 administrators, coordinators, and teachers described outcomes in the area of integrating curriculum and technology. While K-12 administrators differed to the extent to which they perceived that teachers had in fact fully integrated technology within the curriculum, there was agreement about increased engagement on the part of teachers in their use of technology and it's potential in the classroom.

> "We had a similar experience in that one of the two teachers was much more ambivalent about technology to start with and was taking a stance that 'show me this could be a tool in creating a curriculum that I want.' And she was very convinced by the end of it and quite excited about [it]." [Pilot Project Coordinator]

University administrators, coordinators, and teachers described benefits from exposure to university training and research. Specifically the wealth of resources at the university provided an avenue for teachers to increase their knowledge base that they could then apply to curriculum or professional development.

> "... [The IU project] leverages the resources of the campus in very nice way to funnel these resources to the schools. Otherwise these riches would sit here and we [wouldn't] have that kind of bridge." [UC Administrator]

Another outcome measured for teacher practice was teacher collegiality fostered by the project. This included the creation of support networks among certain teachers. Administrative team members and coordinator focus groups, as well as final teacher presentations revealed that collegial systems were forming between different teachers. This process was described as beneficial to the project, and productive for the teachers and curriculum development. One teacher described this process,

> "I will say that anytime that you meet with colleagues you always learn something because you learn form their ideas. You learn from their own ways of doing, there is always something you can get from somebody. You can't do things all by yourself particularly in our field as teachers we need forums like this where we can share ideas where we can see what works for somebody and them formulate that so that we can put those things into our classrooms." [K-12 teacher]

Teachers' attitudes about their professional identity was also described by participants as an area affected through the exposure to new resources, events and activities at the university. Administrative team members, coordinators, and teachers described experiences in which new practices were enabled through exposure to the university-school activities and events. These practices included the integration of university resources and Internet resources within the curriculum. Such unanticipated outcomes reveal a heightened teacher interest in professional development.

> "We are getting people asking for a lot more professional development ... for a lot of those things that we thought they would need... So in a sense, it's great that we have people going beyond the project and [that] they're doing a lot more collaboration with each other." [IU Management Personnel]

2. Sustainability

Within a range of different interviews and focus groups participants spoke to the factors which sustain a collaboration. These factors can be classified into two different levels of analysis. Discussion centered upon factors which would allow individual projects to be sustained, as well as to the sustainablity of the Interactive University Project as a whole. The factors describe both issues related to what is needed to sustain the motivation of individual members, as well as the larger scale issues related to the administration of such efforts.

Individual project level: Administrative team members, teachers and coordinators related that one of the key factors to the sustainabilty of projects in the classroom is their relevance to K-12 curriculum. There is also a need for shared goals between the university and K-12 teacher(s). Teachers need to be able to see the relevance of the project and it's resources to what they want to do in their classrooms. In order to achieve relevance to teachers' curriculums teachers often described that their input is critical.

> "...maybe the Interactive University will make a little more effort from the beginning to include or at least give every teacher the opportunity to come up with what they think they want to use in their classroom, and then we can begin to massage it and see how that can be a project for everybody." [K-12 teacher]

Another issue related to the sustainability of individual projects was the time and funding provided for the role of the coordinator. As the coordinator often deals at the front lines of the collaboration relationship, it is critical that s/he be funded so as to be more available to the teachers, or at the school site. Time and money for this role should be allotted. One coordinator noted that a full-time appointment would allow for this optimal interaction. Furthermore, a prime motivator for the coordinator role was often described as existing within these school site interactions, and through observation of students and classrooms in action.

IU wide: Issues related to the sustainability of the Interactive University Project at the university, and at the school site were also discussed. At the university, the discussions centered upon the designation of possible units on campus to house projects such as the IU. Various university administrators described the need to house the efforts in a research unit, with various departments holding collaborative roles with the unit. One university administrator described that departments with particularly successful projects could remain for periods of time, and new projects and participants could enter as well. Departments with particular research emphases in collaboration and outreach would also play an important role (i.e., the School of Education). Furthermore, the institutionalization of the IU Project under a research unit would allow for the creation of an incentive and recognition structure to attract and maintain faulty member involvement.

At the school site, university and K-12 administrators described the need for development and connections to other sources of funding. There were often visible connections between the efforts of Interactive University and other project grants. The utilization of other funding sources allows for the effort to be sustained.

> "... some of the specific things was working with the leadership to work on additional proposals and opportunities to expand and enrich the work. The staff from IU in Berkeley have been very willing and part of many of our district proposal submissions· Given that, I do see the effort as one that's very valuable for us, that's an important piece in terms of keeping it going." [K-12 Administrator]

3. Scale

The question of salability centers upon finding what is needed to realistically and successfully replicate the project. Factors discussed related to broad issues that need to be addressed in order for the project to effectively extend to other classrooms or other schools. The critical pieces defined by both university and K-12 administrators in interviews were: (1) links to K-12 standards; and (2) teachers' time and access to technology.

In order for K-12 districts to take a project and bring it to scale, it is necessary for the activities of the project to be linked to district curriculum standards. The value for the K-12 school lies in the projects' potential to increase student achievement as related to curriculum standards.

> "Whatever we do in terms of technology-based projects, they need to be linked to the standards and to the curriculum. To be scaleable and replicable throughout the district we need to be able to be link them, again to the standards."[K-12 Administrator]

Secondly, for new teachers to be able to adopt the activities and recreate them within their own classrooms, an investment of time and money in their professional development and access to technology is critical. K-12 administrators noted the importance of teacher collegiality, as described through their discussions about time for teachers to share ideas, and knowledge in both formal and informal settings.

> "To replicate [IU] is going to require continuing support to the [pilot] projects, but also building the capacity so that project participants can then share with others ... in settings where people are able to do that." [K-12 Administrator]

There were also comments about the importance of developing joint collaborative frameworks.

> " A key issue being investigated by the IU project pertains to how outreach activities can be effectively scaled. It appears that if we want large numbers of campus faculty, students, and staff to work together with large numbers of K-12 teachers, students, and family members using the technology we need to develop appropriate collaborative frameworks. These frameworks need to be adopted jointly by K-12 and the University, and need to outline the most effective methods for: (a) using technology for teaching and learning; (b) infusing University digital learning materials into various curricular areas; and (c) integrating relationship-based outreach such as electronic mentoring into regular school and University practices." [Pilot Project Report]

V. Discussion and Recommendations

The findings of this study are consistent with the literature on collaboration and the effective use of technology in the classroom. Important factors for collaboration discussed in the literature (time, commitment, shared vision/goal, and communication) were also identified as important collaboration characteristics by IU participants. Student achievement data from our pilot projects suggest improvements in the areas of literacy, science, art, and technology. Because of delays associated with technology implementation at the school sites, many projects were not able to fully implement their activities as planned. The next phase of IU will target schools with sufficient infrastructure to be able to carry out the teacher professional development and student centered activities.

The amount of time allotted to implement the IU project, and accurately assess student outcomes proved to be too short. With the incredible demands on teacher time, there was a tension between the need to evaluate project processes and outcomes versus the lack of time available for teachers. Also, the value of an evaluation was not always evident to project participants already occupied with project implementation. In some projects, completing evaluation instruments or participating in evaluation activities proved burdensome. This will be a continual dilemma. Strategies need to be developed that allow for better integration of evaluation and assessment measures that can be imbedded in classroom or curriculum as part of the teaching day.

Expertise in education evaluation and assessment was not readily available within pilot projects. This may have contributed to the small number of projects who were able to directly assess student achievement.

Several discussions regarding the IU project evaluation results among key district and UC personnel have yielded the following recommendations to funders, to universities, and to the K-12 community.

To Funders:

- Support various types evaluations, i.e. alternative assessment - portfolio, etc.
- Fund personnel to provide schools with sorely needed on-site technology support – seed funding to be able to demonstrate the value of such personnel to school district and state education leaders
- Allow sufficient planning time, particularly to be able to conduct baseline assessment
- Fund more professional development covering more than just technology, but also how to establish shared goals and well-defined outcomes, and training on evaluation and documentation
- Fund ongoing technology training

To Universities:

- Design projects that increase K-12 student knowledge of college application procedures, college entrance requirements, etc., particularly at middle and high school levels
- Ensure careful balance and coordination of tools, people and resources to carry out student assessment
- More emphasis should be placed on faculty involvement, integrated as part of the project on a long-term basis
- Tap resources from districts' research offices for evaluation purposes
- Establish rewards and incentive structures to facilitate faculty participation in outreach activities

To Universities and K-12:

- Conduct formative evaluation to assess projects as they proceed and improve their design and implementation. Assess classroom impact through curriculum embedded assessments, train teachers to keep careful documentation, through tools such as on-line journals, to determine best practices
- Raise awareness of K-12 and university personnel who were not involved during the first round of IU, i.e. Principals, Curriculum Specialists, Deans and department Chairs.
- Carry out more in-depth planning: school selection, clarification of goals, infrastructure readiness, etc.
- Sustain good projects, discontinue bad projects
- Think of ways to inculcate good outreach, teaching, and learning practices in both K-12 and university personnel
- Conduct ongoing technology professional development in a "co-training" model, where both university and K-12 are trained together in technology, pedagogy, assessment, integration of technology into the curriculum, classroom management using technology, etc.
- Structure activities for the purpose of "merging" university and K-12 identities, i.e. university identity should include being an outreach participant and K-12 identity should include being a reflective practitioner
- Think about how an institutional unit that has a pipeline of relationships with outreach components, as well as graduate, postgraduate, and undergraduate work, could be the host of IU-like projects.

To K-12:

- Pay immediate attention to technical support needs at the school sites
- Get school district administration involved in school readiness issue
- Establish a baseline level of readiness for teachers to participate in technology-based projects (perhaps two tiers of readiness: for teachers participating intensively in the partnership and developing curriculum resources – teacher leaders – and for those participating less intensively who may only field test resources)
- K-12 administrator (Principals) should take on the responsibility of assessing how well teachers integrate technology and curriculum

Appendix A
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Appendix B
IU K-12 Project Key Personnel

- The UC Berkeley Executive Vice Chancellor and Provost Carol Christ (Project Principal Investigator)

- Associate Superintendent for Curriculum Maria Santos (Project Leader at the San Francisco Unified School District - SFUSD)

- Assistant Superintendent for Instruction Yolanda Peeks (Project Leader at the Oakland Unified School District - OUSD)

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Appendix C
Evaluation Plan

University of California, Berkeley Interactive University Project Evaluation Plan

U.S. Department of Commerce TIIAP Grant
Award Number 06-40-96071

November 27, 1996

Prepared by: Dr. Lisa Kala and Dr. Isabel Hawkins Interactive University
Co-Principal Evaluators

I. Introduction

1. Project Summary

The Interactive University Project is a collaboration between the UC Berkeley campus and its surrounding community whose aim is to identify how the University can best use information infrastructure to provide public service. Thirty campus departments and units currently participate as Interactive University Partners. Community Partners include the Oakland and San Francisco Unified School Districts, and community based organizations and public libraries in Oakland. The project serves as the technology partner of the Berkeley Pledge. The UC Berkeley Vice Chancellor and Provost Carol Christ is the project Principal Investigator. The Project's Director is David Greenbaum, and project activities are coordinated by Information Systems and Technology.

The Interactive University is a Department of Commerce TIIAP Demonstration project intended for the K-12 Education primary application area. The University of California, Berkeley, working in partnership with San Francisco and Oakland Unified School Districts, San Francisco and Oakland local government, community based organizations, and industry, will develop a model of how to use information infrastructure to best support K-12 students, their families, and teachers in disadvantaged urban communities. We will identify a set of Internet based outreach methods and partnerships that will enable us to help underserved students succeed in school and be prepared for college, careers, citizenship, and lifelong learning. We seek to develop a national model replicable by other universities and communities.

2. Problem Definition

The broad problem that the Interactive University will address is how the University of California, Berkeley can best provide service to the community using information infrastructure. In particular, we will focus on (a) how to help K-12 students and their families in disadvantaged and diverse urban neighborhoods; and (b) how to provide this assistance in a partnership of support with schools, local government, and community based organizations. The challenge then is how can a University with rich human resources and collections of materials best marshal its efforts to help the lives of disadvantaged students and families, to support teachers, and to assist neighborhoods? And how can it do this in partnership with other critical community institutions? In short, how can we build a set of Internet based interventions which will enable the University with other

service institutions to best attack these problems and needs? The Interactive University project will investigate these critical questions.

3. Areas of Need

Through extensive discussions between UCB campus and community partners, we have identified key needs:

- There exists a great need for training and experimentation with information infrastructure and Internet technologies to provide systemic support for increasing K-12 student achievement in disadvantaged urban communities
- There is a need for a coordinated and sustainable support infrastructure for students, teachers, and families that must come from a comprehensive partnership of schools, families, University outreach programs, community groups, local government, and industry

The Interactive University project is designed to respond to these needs. We will provide: substantial training and professional development; structured experimentation with teachers, students, families, and community members on the use of Internet tools; and build information infrastructure for a multi-institutional partnership of support.

4. Goals

This project's ultimate goal is to build a national model that can be used by other universities and colleges and their community partners to effectively and innovatively link students, families, and community-based organizations to University resources. By a model we mean a set of successful Internet outreach methods, interaction techniques, administrative practices, implementation strategies, cost models, and, when needed, management structures. The Interactive University project will:

- Identify key issues for effectively adapting University resources using information infrastructure for use by the K-12 community
- Develop effective strategies to provide schools and families both access and roadmaps to University resources using information infrastructure
- Develop an electronic network as a medium for exploration, experimentation, and collaboration, creating a powerful formal and informal teaching environment
- Find ways to link research and teaching with community service, encouraging faculty to become involved with educational outreach activities
- Investigate methods of electronic mentoring strategies to involve the academic community in the support of K-12 students, their families and their teachers
- Experiment with all possible existing and developing Internet tools such as e-mail, mail reflectors/lists, chat groups, newsgroups, the World Wide Web, developing WWW collaborative programs, Java, shared whiteboards, MOOs and MUDs, and desktop video-conferencing
- Investigate the appropriate balance of technology-based tools and human interactions for University-based educational outreach projects

5. Pilot Projects

At the foundation of the Interactive University project are collaborative pilot projects involving University and community partners that will address the areas of need and respond to project goals. We will facilitate a wide array of pilot projects including a range of academic disciplines, outreach methods and strategies, and Internet

tools. Some examples of issues that will be explored in the pilot projects include: Are Internet based outreach efforts effective, leading to enhanced student achievement? What is the right balance between human interaction and Internet mediated interaction? Does the technology enable University partners to work effectively with a large(r) number of community members? What special processes and support are required to use the technology? What are the unintended consequences of using technology for outreach? How does the use of technology shape collaboration on and off campus?

II. Evaluation Plan

1. Summary

The Interactive University project evaluation plan addresses two general areas: (a) milestones for the project and the management/implementation strategies that will be employed to assess whether or not the project is making progress in reaching these milestones and (b) formative and summative evaluation to assess how this technology-based project has contributed to addressing the needs, problem definition, and goals described in Section I.

A. Reaching Project Milestones

The Interactive University Project Director and other key management personnel have several years' experience in the successful implementation of large collaborative projects involving institutions of higher education, community partners, and K-12 schools. We will leverage existing successful management techniques and strategies to ensure the smooth implementation and progress of the Interactive University project. We have developed and attached a detailed timeline for the key planning, implementation, and evaluation aspects of the Interactive University project. The timeline identifies key activities, responsible parties to carry out these activities, and expected period of performance for each activity. In combination with the timeline, we attach our project management structure, which we have designed to provide a collaborative environment to maximize communication flow and facilitate reaching project milestones. Various key management personnel will contribute to a project documentation database designed to capture key issues, roadblocks and strategies to overcome them, unintended consequences of using the technology for educational outreach, and effective strategies. As the project activities get underway, we will use on-line questionnaires and monthly reporting structures, as well as Internet and WWW protocols to automatically gather project performance information such as usage of Interactive University WWW sites, progress status, number of teachers served, number of WWW sites created, number of students served, number of workshops, number of electronic field trips, number of site visits, etc. This documentation will be collated, reviewed, and analyzed by project management to ensure effective and responsive action when needed and facilitate the smooth implementation of key project activities. We have established and will continually maintain detailed schedules corresponding to the timeline of project activities. A series of on-going meetings, teleconferences, videoconferences, and on-site visits will be regularly performed involving project managers, campus pilot project personnel, and community participants.

B. Formative and Summative Evaluation

This aspect of the evaluation will be led by Dr. Lisa Kala of the Graduate School of Education and Dr. Isabel Hawkins of the Center for EUV Astrophysics. An essential aspect of this project is an evaluation process that will serve both formative and summative purposes. The formative evaluation process is intended to channel feedback from project participants (University and school partner(s)) to an Evaluation Team and project management maintaining the anonymity of the source. This process will facilitate responsiveness to changes or problems that may arise during the course of the program. The summative aspect of the evaluation will provide

descriptive material and data that will allow assessment of the success of the program, as well as provide valuable insights into the partnership process for future similar programs.

2. Methodology

We will base our evaluation methodology on the goals and objectives underlying this project. With project staff, we will identify and prioritize key model hypotheses to focus the evaluation activities and resources. An overarching project goal is to identify the appropriate combination of human interaction with technology-mediated communication to support an effective relationship allowing the University to best meet K-12 community needs. Our first task will be to assemble the Evaluation Team, finalize the evaluation implementation plan, and develop evaluation templates. Example issues that might be examined are whether effective strategies can be can be identified in the context of scalability and sustainability of the project; whether the involvement of a multi-disciplinary group of University personnel helps in the recruitment of a wide variety of students to attend the University, etc. A product of the evaluation will be a set of criteria and guidelines for successful implementation to be shared with others who want to use the Internet's unique capabilities to link University personnel and schools, research results and classrooms. We will document and disseminate the evaluation results through formative and summative evaluation reports including: Key Learning Experiences (e.g. what obstacles encountered? How were they overcome?, etc.); Effective Strategies (e.g. what worked and why? are strategies sustainable? what were unintended consequences of using technology and information infrastructure?); Recommendations (e.g. what are important issues and steps to take in the context of collaboration? how do Internet tools enable and facilitate University faculty, staff, and students to participate in systemic educational outreach efforts?, etc.).

The Evaluation Team will develop strategies to gather data and test hypotheses, using a combination of human interactions and technology-mediated interactions. Collected data will be made available to all IUP and school partners for in-depth study and subsequent publication. The following data collection methods will be used:

1. pre/post questionnaires
2. journals
3. portfolios
4. observations
5. interviews (audiotaped and videotaped)
6. focus groups

3. Tiered Evaluation Plan

Due to the scope of the project, we propose a tiered evaluation plan comprising two primary levels: 1) Micro-level: pertaining to individual projects, and 2) Macro-level: pertaining to the partnership as a whole. The micro-level evaluation will focus on key issues of student achievement, and the specific consequences of using technology-based methods of outreach. The macro-level evaluation will address project-wide issues of collaboration involving University and community partners. All IU pilot project data will be collated and entered into an electronic database. Below is an outline of the tiered evaluation plan.

MICRO LEVEL - GOAL: MEASURE EFFICACY OF EACH IU PILOT PROJE

Based on information from each IU pilot project and school partner(s), each pilot project leader will be responsible for:

- Collecting own activity data based on evaluation instruments and support provided by the IU Evaluation Team

- Working with the Evaluation Team to summarize individual activity data

MACRO LEVEL - GOAL: ASSESS HOW THE UNIVERSITY AND COMMUNITY

Based on information from each IU pilot project and school partner(s), the Evaluation Team will:

- Collect metric Information (e.g. completion status, # teachers served, # Web sites, # students served, # workshops, # field trips, #WWW hits, etc.)
- Identify Effective Strategies (e.g. What worked in terms of collaboration? When did it happen? How was it done? etc.)
- Describe key Learning Experiences (e.g. What obstacles were encountered? How were they overcome? etc.)
- Make Recommendations based on the analysis of the data collected, and prepare a final report

4. Project Evaluation Personnel

The Project Evaluation Personnel will consist of an experienced team of two professional education researchers and two graduate student researcher with expertise in project evaluation at the formative and summative stages. The Project Evaluation team will be led by two Evaluation Research Specialists, Dr. Lisa Kala and Dr. Isabel Hawkins. These two researchers will be involved from the beginning of the project to define a detailed methodology for carrying out all aspects of project evaluation, including pre/post assessment strategies and detailed definition of deliverables to assess whether project goals and objectives are being met. The Evaluation Research Specialists will guide several graduate student researchers who will perform data collection and organization during the 24 months of the project. The Project Evaluation Research Specialists will be responsible for providing independent analysis of the data on an ongoing basis to allow for formative changes that will contribute to the direction of the project during the period of performance. Dr. Kala and Dr. Hawkins will interface with high level project personnel and provide materials and information to the Project Manager and Project Director for quarterly and final project reports. The Project Evaluators will publish the results of this project in the context of a model of collaboration in refereed educational journals as well as in various forums easily accessible by the K-12 community.

Please send bug reports to the webperson.

Revised February 3, 1997 by Shifra Gaman.

Appendix D
Evaluation Issues vs. Target Audience Matrix

EVALUATION COMPONENT MATRIX

		A. ENHANCE ACHIEVEMENT	B. PROMOTE COLLABORATION	C. INTEGRATE RSCH/TEACH/SVC	D. TECHNOLOGY	E. PROCEDURES & METHODS	F. OVERALL EXP.
		a. knowledge college/univ	a. intra K-12 tech		a. training		a. scale
		b. knowledge-subject area	b. intra K-12 face-to-face		b. tech support		b. sustainability
		c. attitudes-college/univ.	c. intra UCB tech		c. infrastructure		
		d. attitudes-subject area	d. intra UCB face-to-face				
			e. inter K-12/UCB tech				
			f. inter K-12/UCB face-to-face				
1	Students (K-12)	S,M,O*	*	*	*		
2	Teachers (K-12)	S,F,O*	*	*	*	*	*
3	Community College Students	S,M	*		*		
3	Principals	S	*		*	*	*
4	District Adm. (K-12)#	I	*		*	*	*
5	Coordinators & Staff (UCB)	S,F	*	*	*	*	*
6	Faculty (UCB)##	S,F	*	*	*	*	*
7	Administrators (UCB)###	I	*	*	*	*	*
8	Technology Team (UCB)####	S,F	*		*	*	*
9	Liaisons (K-12)	S,F,I	*	*	*	*	*
10	Administrative Team (IU)	S,F	*	*	*	*	*
11	Pilot Project	I	*	*	*	*	*

#	M. Santos, Y. Peeks
##	A. Stacey, A. Agogino, C. Moore, V.Lewis, H. Stahl, R. White, R. Katz, R. Joyce, K. Sastry, D. Dahlston, B. Sadoulet
###	C, Christ, J. McCredie, K. Pister, A. Madrid
####	J. Frantz, P. Hutcher, C. Ashley, C. Yoes, K. Manno, P. Spencer

Key:	
S	Survey/Questionnaire
F	Focus Group
I	Interview
M	Micro Assessment
O	Observation

Appendix E
Sample Evaluation Instruments

University of California, Berkeley
The Interactive University K-12 Project

K-12 Teacher Post Assessment Survey

Project Name: _____ Date:_____

First Name: _____ Grade(s): _____

Last Name: _____

School(s): _____

Semester/Session:_____

Course(s): _____

Please check one:
Female _____
Male _____

Please check one:
Puerto Rican _____
Chicano/Mexican American _____
Latino/Latin American _____
America Indian/Native American _____
White/Caucasian _____
East Indian/Pakistani _____
Polynesian/Pacific Islander _____
Black/African American _____
Filipino/Filipino American _____
Chinese/Chinese American _____
Japanese/Japanese American _____
Korean/Korean American _____
Viet/Thai/other Asian _____
Other (please specify) _____
_____

Directions:
Please complete the attached survey by answering each question as completely as possible. This information will be used to assess the effectiveness of the project.

Please be assured that all responses will be kept strictly confidential and your identities will not be known to any individuals involved in the [project name].

Your thoughts and participation are very important to the success of the project. Thank you for your time and effort.

Interactive University Evaluation Team

Code _____ Revised December 17, 1998

University of California, Berkeley
The Interactive University K-12 Project

K-12 Teacher Post Assessment Survey

1. From your perspective have students' views about college been affected by the [project name] project? (Please elaborate)

2. How useful has the [project name] project been in your classroom? (Please elaborate)

3. From your perspective have students gained new knowledge about college by participating in the [project name] project?

4. In which ways has the [project name] project been helpful/not helpful in your students' academic progress? (Please describe)

5. How has Internet technology (such as: e-mail, the World Wide Web, video-confernecing, chats, MOOs, etc.) facilitated your relationship with UCB partners?

6. What has resulted from your collaboration with UCB?

7. What did you find most useful in collaborating with UCB?

8. How often do you collaborate with any UCB partner after the [project] project?
___ a. 3 or more times per week
___ b. weekly
___ c. monthly
___ d. once a semester
___ e. once a year

Code _____

Comments:

9. What are the strengths and weaknesses of Internet-based interactions (through e-mail , World Wide Web, electronic mailing lists or listservs, etc.)?
Strengths?

Weaknesses?

10. In your opinion, how often should face-to-face interactions between UCB and school partners (yourself, other K-12 staff, and students) occur for a new collaboration to succeed?
Interactions where you participate:
____ a. 3 + times per week
____ b. weekly
____ c. monthly
____ d. once a semester
____ e. once a year

Interactions where other K-12 staff participate:
____ a. 3 + times per week
____ b. weekly
____ c. monthly
____ d. once a semester
____ e. once a year

Comments:

Interactions where K-12 students participate:
____ a. 3 + times per week
____ b. weekly
____ c. monthly
____ d. once a semester
____ e. once a year

Comments:

11. Have your interactions with students been affected? If so how? If not, how would you have hoped your interactions with students to have been affected?

12. Have interactions between students been affected? If so, how? If not, how would you have hoped student interactions to have been affected?

13. How has Internet technology (such as: e-mail, the World Wide Web, video conferencing, chats, MOOs, etc.) facilitated relationships among K-12 colleagues?

14. What has resulted from your collaboration with K-12 colleagues?

15. What have you found most useful in collaborating with K-12 partners?

16. How often do you collaborate with K-12 colleagues on joint projects after the [project] project?

____ a. 3 + times per week
____ b. weekly
____ c. monthly
____ d. once a semester
____ e. once a year

Comments:

17. What resources do you currently use in your classroom activities and curriculum to teach [subject]?

18. What role does Internet technology (such as: e-mail, the World Wide Web, video-conferencing, chats, MOOs, etc.) currently play in students' learning about [subject]?

19. What role does the Internet currently play in your classroom?

20. How can the Internet help students achieve more effectively?

21. Do you feel that the use of the Internet at school is important? (Please explain)

22. How often do you use the Internet (check one)?
____ a. daily
____ b. 2-3 times per week
____ c. once a week
____ d. never
____ e. other (please specify/fill in)_____

Comments:

23. Check below the ways you use a computer (check all that apply):
____ a. e-mail
____ b. www browsing
____ c. usenet groups
____ d. word processing or spreadsheet
____ e. Internet chat or video-conferencing
____ f. games
____ g. educational CD ROMS
____ h. other (please specify/fill in)_____

Comments:

24. How helpful is the Internet in your work (check one)?
____ a. extremely
____ b. very
____ c. somewhat
____ d. not at all

Comments:

25. What difficulties have you encountered in using computers/Internet in your work? List five or so top problems/issues.

1.

2.

3.

4.

5.

26. Please describe the kinds of training you have received in this project.

27. What additional training is needed for this type of project?

28. Please describe the technical support (e.g. general computer and network help on hardware problems, software problems, e-mail/Internet/WWW problems, etc.) you have received from your school/District during this project.

29. What additional technical support is needed for this type of project?

30. Please rate the usefulness of the following Interactive University activities listed below (Please circle):

Interaction with UCB Pilot Project personnel

extremely useful		useful		not at all useful	not applicable
5	**4**	**3**	**2**	**1**	**0**

Comments:

Interaction with Interactive University Management

extremely useful		useful		not at all useful	not applicable
5	**4**	**3**	**2**	**1**	**0**

Comments:

Interaction with District-campus liason

extremely useful		useful		not at all useful	not applicable
5	**4**	**3**	**2**	**1**	**0**

Comments:

31. What do you see as the strengths of this project?

32. What improvements would you suggest for this project?

33. What particular challenges did you encounter in implementing the [project name] project? How were they overcome?

34. Were there any unanticipated outcomes? (Please describe)

35. Name the top three factors that enable a lasting and effective school-university collaboration.

1.

2.

3.

36. Name the top three factors that inhibit a lasting and effective school-university partnership.

1.

2.

3.

37. Please give us examples of how your needs were met (or not met) in order to implement this project.

38. Was the structure of the Interactive University activities sensitive to the demands placed on your time and effort?

39. Were your goals and expected outcomes achieved? (Please describe)

40. Do you have any other comments, or suggestions regarding the [project name] project?

Interactive University (IU) Evaluation
August 1998
UCB Faculty Focus Group

1. Why did you first decide to join IU? What appealed to you about the project?

2. What do you see as your role in the project?
   - How has your role evolved over time?

3. What were your expectations of the project?
   - How have your expectations changed?

4. What factors should university partners consider when collaborating with K-12 schools in educational outreach?

5. What challenges have you encountered working with schools? with your university partners?

6. Were there any unanticipated outcomes in working with schools? in working with university partners?

7. How has the IU project affected your responsibilities as a UC faculty member?

8. How can UC faculty be motivated to sustain a university-school collaboration?

9. What role can Internet technology play to enable educational outreach?

10. What role can Internet technology play in facilitating the integration of research, teaching, and community service?

11. Do you consider participation in educational outreach projects such as IU part of the proper work of the faculty? Please elaborate.

12. Looking back, what would you do differently? the same?

13. Would you participate in IU again and why? If not, what would persuade you to try again?

14. Are there any comments you would like to add?

Interactive University Evaluation
August 1998
K-12 Administrator Interview

(M. Santos/ Y. Peeks)

1. Please describe your original vision for the IU collaboration and in what ways it has evolved.

2. What has been your role in the IU project?

3. How did you facilitate the collaboration between your district and the university? What would you have done differently?

4. What role can Internet technology play in developing a partnership with the university?

5. What have been the challenges in the IU project? For example, encouraging school personnel to work together, developing collaboration with the University, Internet technology issues, etc.

6. Have there been any unanticipated outcomes in the IU project? Please elaborate.

7. How has the IU project contributed to your district's curriculum and professional development program, especially with respect to technology?

8. In your opinion, what criteria are necessary for a technology-based project to:
   (a) be sustained within your district?
   (b) be scaleable or replicable throughout your district?

9. Who do you consider to be key participants in your district and how can they be motivated to sustain this collaboration?

Interactive University Evaluation
August 1998
UC Pilot Project Coordinators Focus Group

1. Why did you first decide to join IU? What about the project appealed to you?

2. What do you see as your role in the project?

3. How has your role evolved over time?

4. What were your expectations of the project?

5. How have your expectations changed?

6. What conditions are necessary for the success of your project:
   (a) at UCB?
   (b) at the school site?

7. What challenges have you encountered working with schools? with your university partners?

8. What did you do to keep the project moving forward (i.e. strategies, technology-based interaction, face-to-face interaction)?

9. How can the IU school district liaisons be used most effectively?

10. What have been the most useful project activities (e.g. events, meetings, etc.)?

11. Given the limited timeframe and resources, how did you alter your project's plan and scope?

12. Were there any unanticipated outcomes in working with schools? in working with university partners?

13. What role can Internet technology play to enable educational outreach?

14. How can UC Pilot Project Coordinators be motivated to sustain a school-university collaboration?

15. Would you participate in IU again and why? If not, what would persuade you to try again?

16. Do you have any comments you would like to add?

Interactive University Evaluation
Spring 1998
K-12 Teachers Focus Group

1. What is needed to build/sustain a successful University/K-12 collaboration?
2. How effective was communication with University partners?
3. How were you involved in any of the planning and decision making?
4. How did the project fit within your curriculum and/or school goals?
5. How did the project fit with your students' interests, skills, ability levels?
6. What have been some of the challenges of the project?
7. How has your IU project contributed to your role as a teacher? What is the best way to use Internet technology for teaching?
8. In view of the difficulties that often arise with Internet technology use in schools (e.g. infrastructure, access, etc.) how did you adjust your activities with the project?
9. What support structures need to be in place for you as a teacher to be able to integrate Internet technology in your classroom?
10. How can teachers be motivated to sustain a school-university collaboration?
11. How useful were IU seminars, training sessions, and meetings to you?
12. In what ways did you work with the district liaison, Mary Ann Valles?
13. If you could be involved in planning from the very first stages, what would you do to develop a project that would be implemented in your classroom?
14. Would you participate in IU again and why? If not, what would persuade you to try again?
15. Do you have any comments you would like to add?